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# USSR Report

CHEMISTRY



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# USSR REPORT CHEMISTRY

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MODIFICATION OF INTERPHASE LAYERS OF IONOGENIC SURFACTANTS-STABILIZERS OF  
DIRECT EMULSIONS

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2: KHIMIYA in Russian  
Vol 27, No 5, Sep-Oct 86 (manuscript received 11 Jul 85) pp 524-530

[Article by Z.N. Markina, N.M. Zadymova, O.P. Bovkun and N.N. Tsikurina,  
Department of Colloid Chemistry]

[Abstract] A study of the effect of additions of electrolytes, the nature of the non-polar phase and organic additions in the aqueous and butyric phases on the mechanism of formation and structural features of interphase layers of anion-active and cation-active surfactants was performed by precision tensiometric measurements, selection of appropriate equations of state of the monolayer, analysis of thermodynamic functions of surfactants adsorption and their surface activity and assessment of the strength of the adsorbed layers and stability of the relevant emulsions. A change of concentration of the inorganic electrolyte in the solution may change the degree of penetrability of ionogenic surfactants in water and thus regulate cohesion interaction in the layer. Use of cetyltrimethylammonium bromide after microcapsulation was effective with electrolyte additions where there are hydrophobic interactions between sections of hydrocarbon chains of diphilic ions, immersed in water. These data may be used to regulate processes of production of stable highly-dispersed liquid-phase heterogenic systems, important in medicine. Figures 4; references 10: 8 Russian, 2 Western.

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CSO: 1841/60

## ASSESSMENT OF INTENSITY OF SPONTANEOUS SURFACE CONVECTION DURING EXTRACTION OF SURFACTANTS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 10, Oct 86  
(manuscript received 11 May 85) pp 2222-2226

[Article by Yu.A. Konshin and A.A. Yermakov]

[Abstract] The possibility of quantitative assessment of spontaneous surface convection intensity arising during liquid extraction is demonstrated and discussed. Experimental data were analyzed with consideration of the possibility of existence of 2 regimes of spontaneous surface convection with consideration of the different nature of effect of interphase tension of the extraction system on the intensity of these regimes. Experimental study of mass transfer of the surfactants provided criterial equations for calculation determination of both regimes of spontaneous surface convection on the basis of physical and chemical properties of extraction systems which consider the value of free energy distribution. Equations obtained for calculation of spontaneous surface convection intensity made it possible to select the most efficient extrahent for carrying out the process with the greatest spontaneous surface convection intensity on the basis of physical and chemical properties of the extraction systems and the transferable substances. References 16: 13 Russian, 3 Western.

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CSO: 1841/39

## EFFECT OF ULTRASOUND ON STRUCTURE OF SOLUTIONS AND POROSITY OF ADSORBENTS OBTAINED

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHIMICHENYKH NAVUK in Russian No 5, Sep-Oct 86 (manuscript received 8 May 86) pp 13-16

[Article by V.S. Komarov, O.F. Skurko and N.S. Repina, Institute of General and Inorganic Chemistry BSSR Academy of Science]

[Abstract] Sulfuric salts of aluminum and copper (5 percent and 10 percent solutions) underwent sonic treatment for 1, 2, 3 and 5 minutes. The adsorption capacity of samples from sonically treated 5 percent  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{CuSO}_4$  solutions increased with the increase of time and intensity of processing. Adsorption capacity of samples from 5 percent solutions of  $\text{Al}_2(\text{SO}_4)_3$  irradiated for 1 minute increased 72.8 percent while that of samples obtained from 10 percent solutions increased 43.2 percent compared to control growth of 43.2 percent. Increase of adsorption capacity of



samples treated for 2 minutes was 2.1 percent and 0.3 percent, respectively. Basic structural changes in the solution occurred in the first minute of treatment regardless of the processing intensity due to an increase of the degree of ion association as a result of rupture of their hydrate shell by the shock wave forming upon collapse of the cavitation bubble. The degree of degassing of the solution increased with increase in duration of exposure to sonic treatment and reached a state of specific equilibrium in a 2-phase water-air system. Ultrasonic treatment of the salt solutions evoked 2 processes directed toward ion association: one involves breakdown of the hydrated ion shells and the other involves ultrastructural associations of them. Figure 1; references 8: 4 Russian, 4 Western.

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CSO: 1841/59

FORMATION, MOTION AND CONDENSATION OF ORGANIC SILICON POLYMER AEROSOLS IN A GLOW DISCHARGE

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 20, No 6, Nov-Dec 86  
(manuscript received 13 Mar 85) pp 541-547

[Article by V.I. Zyn, V.K. Potapov, L.S. Tuzov and A.M. Shterenberg,  
Kuybyshev Polytechnic Institute, imeni V.V. Kuybyshev]

[Abstract] A study is reported of processes of development, movement and condensation of aerosols formed in an anomalous glow discharge by electron-microscope and optical photography methods. Changes in the gas composition in a reactor are studied by mass spectrometry. The mass of polymer formed and gaseous products synthesized is estimated for specific discharge conditions. Polymerization was performed in a glass vacuum vessel of  $1.5 \cdot 10^{-2} \text{ m}^3$  connected to a mass spectrometer through a  $30 \text{ }\mu\text{m}$  diameter diaphragm and  $1.2 \cdot 10^{-2} \text{ m}$  diameter tube  $0.35 \text{ m}$  in length. The photographic studies found that macroscopic particles were formed in a narrow cathode glow zone at the boundary with the positive column in the immediate vicinity of the electrodes. The mass of the aerosol increases linearly with time. Mass spectrometry yields an estimate of the quantities of various products of gas-discharge synthesis over a period of 3 minutes. Figures 4; references 10: 9 Russian, 1 Western.

6508/9835  
CSO: 1841/92

## ALKALOIDS

UDC 615.32+612.741

### ALKALOID AKUAMMINE AS STIMULANT OF SMOOTH MUSCLE SEROTONIN RECEPTORS

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 119, No 3, Sep 85 (manuscript received 23 Dec 83) pp 541-544

[Article by M.G. Lebanidze and M.D. Gedevanishvili, Institute of Pharmacochimistry Chemistry imeni I.G. Kutateladze, GSSR Academy of Sciences]

[Abstract] The alkaloid akuamine, isolated from periwinkle Vinca herbacea, is an indolene derivative which acts as a stimulant of the contractile activity of the smooth muscle cells of isolated rat stomach. This substance is also highly sensitive towards serotonin in the presence of D-type serotonin receptors and experiments were conducted to clarify their role in initiating the stimulant activity of akuamine. A study of the conjugative effects of akuamine and serotonin on stomach muscle contractile activity and their reaction with known serotonin antagonists shows that the alkaloid has partial antagonist property by reacting with the D-type serotonin receptors of stomach muscle cells. Figures 2; references 8: 6 Russian, 2 Western.

12765/9835

CSO: 1841/440

UDC 537.534.7

HIGHLY EFFECTIVE ION SOURCE FOR ANALYSIS OF TRANSURANIUM ELEMENTS

Leningrad *RADIOKHIMIYA* in Russian Vol 28, No 3, Mar 86  
(manuscript received 1 Dec 83) pp 428-431

[Article by V.V. Kalygin and V.Ya. Gabeskiriya]

[Abstract] A prototype ion source for isotope separation was developed. The ionizer and ion source evaporator are made of tantalum and consist of a closed space 1.6 mm dia X 15 mm length with an opening 0.2 mm. The ionizer and evaporator are heated by electron bombardment and are capable of temperatures as high as 2700 K. The ion source increases the sensitivity of mass spectrometric measurement of transuranium elements by two orders of magnitude. It also makes it possible to conduct isotope analysis with a high salt content in the sample, and to study nuclear fuel characteristics without chemical separation of the elements. Figures 2; references 4: 1 Russian, 3 Western.

12765/9835  
CSO: 1841/596

UDC: 621.09.54:539.128.4.144:539.166.3

DETERMINATION OF AMERICIUM AND CIRIUM CONTENT IN SPENT NUCLEAR FUEL BY MASS SPECTROMETRY

Leningrad *RADIOKHIMIYA* in Russian Vol 28, No 3, Mar 86  
(manuscript received 1 Dec 83) pp 427-428

[Article by V.V. Kalygin and V.Ya. Gabeskiriya]

[Abstract] The feasibility of conducting americium and cerium isotope analysis in a single fraction of spent nuclear fuel without chemical separation of the elements was demonstrated. This was made possible by using a highly effective surface ionization technique while conducting the mass spectrometry measurements. The ion source was used to determine americium and cerium content in nuclear fuel by isotope dissolution. Figure 1; references 3 (Russian).

12765/9835  
CSO: 1841/596

## ANALYTICAL USE OF CHROMAZUROL S-COPPER (II) NONIONOGENIC SURFACTANTS SYSTEM

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2: KHIMIYA in Russian Vol 27, No 5, Sep-Oct 86 (manuscript received 5 Aug 85) pp 497-500

[Article by E.K. Ivanova, I.N. Petrunina, Ye.I. Markova and P.A. Perov, Department of Analytical Chemistry]

[Abstract] A study of the analytical possibilities of a chrome azurol S-nonionogenic surfactant-Cu(II) system for use in creating a non-extraction method of determining nonionogenic surfactants in waters is described and discussed. Study of 2-component (chrome azurol S-Cu(II), chrome azurol S-nonionogenic surfactant) and 3-component (chrome azurol S-nonionogenic surfactant-Cu(II)) systems revealed a photometric method of determining nonionogenic surfactants in aqueous solutions. Nonylphenol was used as a nonionogenic surfactant in developing the method and other alkylphenols and alcohols with different degrees of oxyethylation were tested. The method was found to be suitable for use in determining different nonionogenic surfactants and mixtures of them in concentrations of  $(0.1-1) \cdot 10^{-4} \text{M}$ . Determination of higher concentrations of nonionogenic surfactants of  $(1-10) \cdot 10^{-4} \text{M}$ . Determination of higher concentrations of nonionogenic surfactants of  $(1-10) \cdot 10^{-4} \text{M}$  required an increase of the chrome azurol and copper concentration. Figures 2; references 13: 12 Russian, 1 Western.

2791/9835

CSO: 1841/60



FIRST SYNTHESIS OF ETHYLENEBISPORPHYRINS

Riga KHIMIYA GETEROTSIKLICHESKIKH SOYEDINENIY in Russian No 2, Feb 86  
(manuscript received 27 May 85) pp 278-279

[Article by G. V. Ponamarev and A. M. Shulga, Institute of Biophysics, USSR Ministry of Health, Moscow; Institute of Physics, BSSR Academy of Sciences, Minsk]

[Abstract] A study of the properties of ethanebisporphyrin compounds at 70° in acetic acid for 20 minutes revealed a nearly quantitative amount of new substances with higher chromatographic mobility on silica gel in comparison with the original porphyrins. Paramagnetic resonance and mass spectra data corroborated the structure of the isolated compounds as that of previously unknown ethylenebisporphyrins. Reference 1 (Russian).

2791/9835  
CSO: 1841/38

## CATALYSIS

UDC 541.128

### COMPARATIVE STUDY OF PHENOL AND BENZENE OXIDATION PROCESSES OVER VARIOUS VANADIUM-MOLYBDENUM CATALYSTS

Kiev KATALIZ I KATALIZATORY in Russian 1985 (signed to press 19 Aug 85)  
(manuscript received 5 Mar 84) pp 54-57

[Article by T.A. Tatarinova, Yu.V. Belokopytov and A.V. Strashnenko,  
Institute of Physical Chemistry imeni L.V. Pisarzhevskiy, UkSSR Academy of  
Sciences, Kiev]

[Abstract] In the oxidation of benzene to maleic acid anhydride with molecular oxygen, it is assumed that phenoxyl, quinoid and maleate intermediate compounds are sequentially oxidized on the catalyst surface. In the present work a study was made of the oxidation of an intermediate, phenol, and the reactivities of both phenol and benzene under identical conditions over various vanadium-molybdena catalysts were compared. The study shows that the relationship of catalyst composition to degree of conversion is analogous for phenol and benzene, and that 75%  $V_2O_5$ -25%  $MoO_3$  provides maximum catalytic activity. The addition of phenol during dual oxidation of phenol and benzene inhibits benzene oxidation. It was concluded that the same active sites participate in the oxidation of both benzene and phenol. Figure 1; references 7: 5 Russian, 2 Western.

12765/9835  
CSO: 1841/561

## POSSIBILITY OF USING CARBON FIBER FABRICS AS CATALYSTS

Kiev KATALIZ I KATALIZATORY in Russian 1985 (signed to press 19 Aug 85)  
(manuscript received 28 Feb 83) pp 58-61

[Article by S.S. Stavitskaya, I.A. Tarkovskaya and T.N. Burushkina,  
Institute of Physical Chemistry imeni L.V. Pisarzhevskiy, UkSSR Academy of  
Sciences, Kiev]

[Abstract] The possibility of using carbon fiber fabrics as a catalyst in redox and protolytic reactions such as hydrogen peroxide decomposition, cumene oxidation, liquid phase esterification of acetic acid with butanol and transesterification of fatty mixtures for food purposes was studied. It was demonstrated that the catalytic activity of active carbon fiber fabrics may be regulated by the same procedures used in ordinary active carbons. Some of the fabrics compare with well-known active charcoals in catalytic activity and may be used in a number of redox and protolytic reactions. Figure 1; references 14 (Russian).

12765/9835  
CSO: 1841/561

## STUDY OF ACTIVITY OF Mg-Co-Mo OXIDE SYSTEMS IN REACTIONS OF SINGLE STAGE DEHYDROGENATION OF n-BUTANE INTO BUTADIENE-1,3

Kiev KATALIZ I KATALIZATORY in Russian 1985 (signed to press 19 Aug 85)  
(manuscript received 2 Sep 83) pp 87-90

[Article by L.P. Shapovalova, V.P. Lukyanenko, V.A. Doroshenko, L.N. Rayevskaya and D.N. Tmenov, Petrochemistry Department, Institute of Physical-Organic Chemistry and Coal Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] The catalytic activities of pure magnesium, iron, cobalt, nickel and magnesium molybdates and that of magnesium-molybdenum, cobalt-molybdenum and cobalt-magnesium-molybdenum catalysts in n-butane to butadiene-1,3 dehydrogenation reactions were studied. In the case of the pure molybdates, dehydrogenation products are first formed over all of the catalysts. Prolonged operation with the magnesium-molybdenum catalyst, in contrast to cobalt-magnesium, results in a decrement in specific catalytic activity. Combined cobalt-magnesium-molybdenum catalysts exhibit the additive properties of cobalt-molybdenum and magnesium-molybdenum catalysts. Figure 1; references 6: 5 Russian, 1 Western.

12765/9835  
CSO: 1841/561

## STABILITY OF IRON-CHROMIUM CATALYST FOR CARBON MONOXIDE CONVERSION

Kiev KATALIZ I KATALIZATORY in Russian 1985 (signed to press 19 Aug 85)  
(manuscript received 26 Sep 83) pp 90-93

[Article by E.L. Furen, G.A. Kolesnik, M.S. Fingerova and Z.V. Komova,  
State Scientific-Research and Design Institute of Methanol, Motor Oil  
Components and Products of Organic Synthesis, Severodonetsk]

[Abstract] The effects of temperature and pressure changes during the conversion of carbon monoxide with steam on the activity and specific surface of iron-chromium and iron-chromium-potassium catalysts was studied. At atmospheric pressure, the activity of both catalysts diminished only slightly with rising temperature, the activity of the promoted catalyst being 1.6 times greater than that of the nonpromoted catalyst. At 30 atm pressure, however, a marked drop in activity was observed in both catalysts, and at 673K and higher, the promoting effects of potassium diminished. References 6 (Russian).

12765/9835  
CSO: 1841/561

UDC 661.094.56

## ADSORBENT OF PLATINOIDS IN NITRIC ACID PRODUCTION

Kiev KATALIZ I KATALIZATORY in Russian 1985 (signed to press 19 Aug 85)  
(manuscript received 20 Apr 84) pp 95-99

[Article by N.F. Kleshchev, A.P. Domarev, M.M. Karavayev, S.P. Tverdokhlebov and B.M. Kipnis, Kharkov Polytechnic Institute]

[Abstract] Calcium oxide is an optimum adsorbent for the recovery of platinoid metals in nitric acid production, although it must be modified to overcome excessive moisture absorption. In the present work calcium oxide was milled at 5,000-20,000 rpm in a pulverizing mill. The pulverized calcium oxide, having maximum surface area after the treatment, allows for more intense interaction between the particles in the charge as compared to calcium oxide obtained by crushing in a ball mill. Figures 3; references 10: 9 Russian, 1 Polish.

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CSO: 1841/561

## ULTRASONICATION OF CATALYST CARRIERS

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 6, Nov-Dec 86  
(manuscript received 15 Jul 86) pp 39-42

[Article by A.V. Romenskiy, A.Ya. Loboyko and V.I. Atroshchenko, "Azot"  
Production Association, Severodonetsk; Kharkov Polytechnic Institute]

[Abstract] An analysis was conducted on catalysts used for the synthesis of vinyl acetate and methane conversion to evaluate the effects of ultrasonic and thermal processing of the catalyst carrier: Ultrasonication treatment time required for optimal activity was 60-fold shorter than the heat treatment. In addition, with ultrasonication, the temperature requirement was reduced two-fold while catalytic activity increased by 92% for vinyl acetate synthesis and by 26% for methane conversion. The effects of ultrasonication were attributed to an increase in the Knudsen diffusion coefficient. References 8 (Russian).

12172/9835  
CSO: 1841/100

UDC 546.732:541.141.1

## PHOTOCATALYTIC LIBERATION OF HYDROGEN FROM CYANAMINE COBALT COMPLEX SOLUTIONS

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 20, No 6, Nov-Dec 86  
(manuscript received 20 May 85) pp 526-528

[Article by A.G. Myakonkiy, N.V. Kalinina, M.B. Rozenkevich and Yu.A. Sakharovskiy, Moscow Chemical Engineering Institute imeni D.I. Mandeleev]

[Abstract] An earlier work showed that when mixed cyanoethylene diamine complexes of cobalt were used as photocatalysts of hydrogen liberation from solutions, the rate of hydrogen formation was greater than in solutions of cobalt (II) pentacyanide. This article presents data on the photocatalytic properties of certain other cobalt cyanamine complexes. Solutions of mixed cyanoammonate and cyanomonoethanolamine complexes of cobalt were studied. All of the solutions studied are unstable in the dark, liberating hydrogen. The photochemical liberation of hydrogen in the systems studied is catalytic. At  $\lambda > 320$  nm, the use of mixed cyanamine cobalt complexes can almost double the effectiveness of light in the production of hydrogen. The results are explained by the fact that in formation of the coordination sphere with different ligands, the oxidation-reduction potential of the complex is changed, so that the aging reaction becomes thermodynamically more favored. The increase in hydrogen liberation for light with  $\lambda > 320$  nm may also be related to the increase in absorption of light due to the change in the spectral characteristics of the solutions studied. Figure 1; references 6: 3 Russian, 3 Western.

6508/9835  
CSO: 1841/92



UDC 541.124:539.12...17:533.1:546.212.024-123:546[286-31+72+621+226]:543.-422.27

DEATH OF OH RADICALS ON SURFACE OF MATERIALS SIMILAR IN CHEMICAL COMPOSITION TO AEROSOL PARTICLES IN ATMOSPHERE

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 5, Sep-Oct 86  
(manuscript received 18 Nov 85) pp 1069-1074

[Article by Yu.M. Gershenzon, A.V. Ivanov, S.I. Kucheryavyy and V.B. Rozenshteyn, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] The purpose of this work was to measure the probability of death of a particle in a single collision with a surface for OH radicals on surfaces of quartz, oxides of aluminum and iron, sulfuric acid and ice in a quartz reactor, the surface of which was completely covered with teflon. Values of the probability  $\gamma$  were measured at 253 to 348 K, pressure 1 to 4.5 mmHg. Results of the studies were used to model photochemical processes in the troposphere to determine the influence of aerosols on the content of minor troposphere components such as  $O_3$ , NO and CO. The measurements showed that the probability of death of OH radicals on the surfaces of substances similar in chemical composition to aerosol particles in the atmosphere was quite high. For  $SiO_2$  particles,  $\gamma^{OH} = 10^{-2}$ , for metal particle  $\gamma^{OH} = 0.1$ , for ice and sulfuric acid  $\gamma^{OH} = 1$ . Figures 4; references 10: 8 Russian, 2 Western.

6508/9835  
CSO: 1841/115

UDC 541.124

MANGANESE CATALYST FOR WATER OXIDATION FIXED ON BILAYERED LIPID MEMBRANE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 3, Nov 86  
(manuscript received 2 Dec 85) pp 632-635

[Article by Ye.I. Knerelman, N.P. Luneva, V.Ya. Shafirovich and A.Ye. Shilov, corresponding member, USSR Academy of Sciences Division of Chemical Physics Institute, USSR Academy of Sciences, Chernogolovka, Moscow Oblast]

[Abstract] The oxygen-releasing center in plant photosynthesis contains manganese ions which catalyze formation of  $O_2$  molecules. In the present work, an attempt was made to fix manganese catalyst on the surface of lipid vesicles in an attempt to provide directed regulation of the number of manganese ions in the catalytic center. It was shown that addition of excess  $Ru(bpy)_3^{3+}$  (I) to  $Mn^{2+}$  solution leads to formation of  $MnO_2$  which in turn catalyzes formation of  $O_2$  during oxidation of water by I. Addition of vesicles to the reaction mixture increased the yield of oxygen per oxidizer used. The oxygen was shown to be formed from water. Fixed on the

vesicle surface, manganese catalyst could be used in photocatalytic formation of oxygen. Thus it was shown that fixation of manganese ions on the surface of lipid membrane helped to intensify catalytic activity of this complex. This could be due to diminished size of catalytically active  $MnO_2$  particles or by specific interaction of  $Mn^{2+}$  in a cluster of atoms found in polar "head" of a phospholipid. Figures 2; references 8: 2 Russian, 8 Western (2 by Russian authors).

7813/9835  
CSO: 1841/97

UDC 541.128.35:541.49:547.898

HIGH MOLECULAR WEIGHT CATALYSTS IN ORGANIC SYNTHESIS. 11 COMMUNICATION.  
NEW OPEN CHAIN ANALOGS OF POLYMER SUPPORTED CROWN ESTERS IN ORGANIC  
SYNTHESIS

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR: SERIYA KHIMICHESKAYA in Russian  
No 5, Sep-Oct 86 (manuscript received 29 Jul 85) pp 618-624

[Article by M.K. Klyavinsh, A.S. Roska, A.Kh. Zitsmanis, R.K. Shitse, and  
Ya.R. Liyepinsh, All-Union Scientific Research Institute of Applied  
Biochemistry, NPO Scientific Production Association "Biolar"]

[Abstract] Continuing the search for effective triphase catalysts, novel open chain crown esters were obtained from chloromethylated copolymers of styrene and divinylbenzene. These compounds retained their functional groups and complex-forming ability. All of them possessed satisfactory catalytic activity in Knoevenagel condensation and nucleophilic substitution reactions. These compounds are inexpensive and easily available, therefore they are adequate substitutes for polymer-supported crown esters. References 20: 3 Russian, 17 Western.

7813/9835  
CSO: 1841/90

## CHEMICAL INDUSTRY

### CARBON DIOXIDE SHORTAGES IN UkSSR

Moscow EKONOMICHESKAYA GAZETA in Russian No 51, Dec 86 p 16

[Article by Doctor of Technical Sciences K. Yushchenko, deputy director, and P. Ignatchenko, deputy section head, of Electric Welding Institute imeni Ye.O. Paton, Ukrainian SSR Academy of Sciences: "There Does not Have to Be a Shortage"]

[Text] Carbon dioxide is a material that is widely used in literally all branches of the national economy. Specifically, only mechanized welding under the protective atmosphere of carbon dioxide has made it possible to sharply increase welding productivity and to reduce the unit cost of weld material. This is the situation in industry. And, in agriculture, carbon dioxide is used for feeding fruit plants in hotbeds and in long-term storage of crops.

The use of carbon dioxide is attractive in petroleum production. Pumping of liquefied carbon dioxide into oil wells makes it possible to increase the oil yield by up to 15 percent. The Bashkiria oilfield workers obtain six additional tons of crude for each ton of carbon dioxide pumped into a well.

It would take a long time to enumerate the known ways of utilization of carbon dioxide, and science suggests quite a few other applications. However, the range of applications of carbon dioxide is growing faster than its production. Currently, less than 70 percent of the demand for carbon dioxide is being satisfied. Its shortage is felt particularly in the summer, when large quantities of it are used in the production of soft drinks. At a number of enterprises, this even makes it necessary to switch from automatic to manual welding. This situation is annoying particularly because the raw materials for carbon dioxide production are plentiful.

At the enterprises of the USSR Ministry of Petrochemical Industry and Ministry of Fertilizer Industry, millions of tons of carbon dioxide, which requires almost no purification, are released into the atmosphere. It forms there as a byproduct in the production of ammonia and methanol.

It is necessary to build carbon dioxide stations for its final purification. Equipping these stations would not require large capital expenditures. But

these industries produce enough carbon dioxide for their own needs, and that is why year after year they fail to find construction capital.

At the present, carbon dioxide is produced in approximately 300 enterprises and is used in thousands of them. Furthermore, the enterprises are distributed unevenly throughout the country; the supply is out of balance with the demand in various areas. It is not infrequent that a region that has large carbon dioxide resources receives large quantities of it from far away. The Donetsk-Dnepr basin is a striking example of such a situation.

In our opinion, regional depots for storage and centralized distribution of carbon dioxide should be established, and carbon dioxide should be accumulated during the periods of minimum demand and then smoothly distributed to the users. For example, in the Moscow Oblast such a depot can be established in the vicinity of the Voskresensk Chemical Combine.

As early as the beginning of the Ninth Five-Year Plan, the All-Union Scientific Research Institute for the Refrigeration Industry, in conjunction with USSR GOSSNAB [State Planning Commission for Supply of the National Economy of the USSR Council of Ministers], developed a plan for regionalizing production and use of carbon dioxide over the entire USSR. However, this good work was never put in practice. We should return to it, which our institute has indeed suggested to USSR Gosagroprom. Regrettably, thus far, there is no response.

In our view, a head organization should be designated to regionalize the production and use of carbon dioxide, recommend construction of new production facilities, determine the requirements, and study demand for carbon dioxide and for equipment for its production.

This is a big interindustry problem that should be solved without delay.

12973/9835

CSO: 1841/128

## AWARDS FOR ACHIEVEMENTS IN CHEMISTRY

Moscow KHIMIYA I ZHIZN in Russian No 1, Jan 86 pp 14-19

[Article by V.N. Peresunko and I.A. Dadchikov: How To Distribute Laurels]

[Abstract] An attempt was made to solve the problems of fair recognition and premium pay, i.e. the so-called laurels, for achievements in a major research and development project where a multitude of variously trained and inspired personnel participated, by using an "expert-normative" approach. This method was used at the All-Union Scientific-Research Institute of Petrochemistry when they developed and put on-stream a complex oxo-synthesis process for producing butyl alcohols and 2-ethyl-hexanol from petroleum. The topical plan of the project was carefully analyzed over a period of several years and "coefficients" based on the number of man-months each component contributed were computed. These coefficients were then used as normatives to calculate the share of each unit in the total economic effect, which was then used as a basis for allotting the premiums and other forms of recognition.

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CSO: 1841/432

UDC 677.4:658.5

## MANAGEMENT OF TECHNICAL CREATIVITY IN PRODUCTION ASSOCIATIONS

Moscow KHMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 86 pp 3-5

[Article by V.T. Butkin, Yu.I. Galaktionov and V.I. Krolovetskiy]

[Abstract] The "Khimvolokno" Mogilev Production Association [PO] is one of the leading producers of chemical fibers in the USSR, a fact that has been recognized by an award of the Lenin Prize, among others. During the 11th Five-Year Plan period, the Mogilev plant improved its labor productivity by 41.2% through the combined efforts of engineers, systems analysts, innovators, and workers. Almost half of the production at the present time meets State Quality standards. The workers and management of



Khimvolokno have demonstrated their dedication to the progress of socialism in a concrete fashion, and can be expected to continue their tradition of excellence and adherence to the party program as set forth in the resolutions of the 27th Party Congress.

12172/9835  
CSO: 1841/88

UDC 658.310.31:006.063

#### CERTIFICATION OF WORK SITES AS FACTOR PROMOTING LABOR PRODUCTIVITY

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 86  
(manuscript received 2 Apr 86) pp 52-54

[Article by M.Z. Gurevich and D.M. Portnov]

[Abstract] A discussion is presented of the various ramifications of work site certification, particularly as labor productivity is affected. Specific examples have been selected from the experience at the Khimvolokno Production Association in Mogilev, demonstrating the need for the participation and cooperation of a number of experts from different fields in work site assessment. The certifications are designed to regulate work sites that fall below the accepted norms. If that is impossible, such work sites are liquidated. The certification plans have revealed the fact that a number of plants within the Khimvolokno Association require fundamental restructuring to increase their efficiency.

12172/9835  
CSO: 1841/88

NON-STATIONARY NEAR-LIMIT PHENOMENA DURING INHIBITED DIFFUSION COMBUSTION

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 5, No 4, Apr 86  
(manuscript received 12 Apr 85) pp 534-538

[Article by V.I. Yeremin, V.M. Nikolayev and A.S. Bobkov, All-Union  
Scientific-Research Institute of Fire Protection, Balashikha]

[Abstract] Study of the inhibition mechanism in diffusion burning is interesting both from the practical and theoretical standpoints. The purpose of the present work was to study the effects of an inhibitor on the near-limit diffusion combustion of hexane as a model fuel. Experiments were conducted with a previously-developed method employing a side stream of air containing varying amounts of freon as inhibitor. High speed cine photography was used to record the results. Evidently, carbon particles play a significant role in the transition from fluctuating to spin burning. These particles are formed intensively when an inhibitor is present, and since the temperature of these particles may be higher than that of the gas stream, they act as a heat sink creating excess enthalpy in flame front and therefore more stable spin conditions are realized and the spread rate of the leading edge of the flame is increased several times. Figures 3; references 19: 13 Russian, 6 Western.

12765/9835  
CSO: 1841/563

## REACTIONS OF METALS WITH GASEOUS FLUORINE DURING COMBUSTION

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 5, No 4, Apr 86  
(manuscript received 21 Mar 85) pp 557-565

[Article by V.S. Logachev and Yu.V. Frolov, Institute of Chemical Physics,  
USSR Academy of Sciences, Moscow]

[Abstract] Compositions containing up to 80% metals such as aluminum, magnesium, tungsten, boron and beryllium and a fluorine-containing compound as oxidant-binder have been used to obtain materials having high hardness, metal-filled explosives and pure metals from the compounds. To optimize the ignition, combustion and heat exchange processes of the metal with a high enthalpy gas, however, a knowledge of the kinetic mechanism of ignition and burning as functions of the combustion conditions and external pressure of the oxidant becomes essential. In the present work thermokinetic constants for reactions between aluminum, magnesium, tungsten, tantalum, molybdenum, nickel and zirconium with fluorine were determined and their ignition and burning temperatures were then used to formulate the metal-fluorine reaction mechanisms. At temperatures above 900K, fluorination is a linear process. Figures 4; references 37: 33 Russian, 4 Western.

12765/9835  
CSO: 1841/563

## EFFECT OF FREE-CONVECTION FLOW ON SPREAD AND EXTINCTION OF FLAMES IN SLOW BURNING GAS MIXTURES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 5, No 1, Jan 86  
(manuscript received 28 Jun 84) pp 129-132

[Article by E.A. Shtessel, V.N. Krivulin, Ye.A. Kudryavtsev and A.N. Baratov, All-Union Scientific Research Institute of Fire Prevention, Balashikha; Department, Institute of Chemical Physics, USSR Academy of Sciences, Chernogolovka]

[Abstract] A study was made of some of the characteristics associated with the burning of gas-air mixtures in bulk volumes (8 cu. meters) where free convection takes place. The gas mixtures consisted of methane, propane or ammonia with air at concentrations near the upper and lower limits of combustion. The experimental data were used to construct an approximate model of the convective limit of flame spread by utilizing the flame front tension concept. A mathematical expression for the limiting velocity of combustion was derived and the mechanism of the effect of convection on flame extinction

counter to the gravity vector is discussed. Figures 2; references 10: 9 Russian, 1 Western.

12765/9835

CSO: 1841/426

UDC 541.124.7'126:541.183:546.21:546.281+535.731

HETEROGENEOUS CHAIN SPONTANEOUS COMBUSTION OF SILANE WITH OXYGEN AND PARTICIPATION OF SURFACE IN BRANCHING OF CHAINS

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 5, Sep-Oct 86  
(manuscript received 24 Dec 85) pp 1086-1095

[Article by V.V. Azatyan and R.G. Ayvazyan, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] New kinetic regularities are described indicating that, under certain conditions during the course of chain combustion, heterogeneous chain branching also occurs, i.e., reactions of adsorbed active chain centers occur leading to an increase in the number of chain branches even before a chain is broken. Experimental studies were performed on the example of oxidation of silane by oxygen near the first limit of spontaneous combustion. The reaction was performed under static conditions in a cylindrical quartz vessel 4.3 cm in diameter with two optically transparent quartz windows opposite each other on the axis. The reaction mixture was rapidly pumped into the evacuated and sealed vessel at 523 K. The pressure and chemiluminescence during the reaction were recorded. The first flash was found to develop and remain in a relatively thin layer at the surface of the reactor, the second flash being located away from the surface. The surface in contact with the reacting gas participates in chain processes not only by breaking and forming chains, but also in the development of the chains, meaning both continuation and branching of chains. Adsorbed active centers participate in the development of the chains. Transition is possible from a degenerate branching mechanism of the chain process to a mechanism with branching chains, with adsorbed active intermediate products playing an important role. Figures 4; references 26: 23 Russian, 3 Western.

6508/9835

CSO: 1841/115

## COMBUSTION CHARACTERISTICS OF TETRAZOL-SODIUM TETRAZOLATE MIXTURE

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 30, No 11, Nov 86  
(manuscript received 3 Jun 86) pp 1002-1004

[Article by A.I. Lesnikovich, V.V. Sviridov, corresponding member of BSSR Academy of Sciences, G.V. Printsev, O.A. Ivashkevich and P.N. Gaponik, Scientific-Research Institute of Physical Chemical Problems, Byelorussian State University imeni V.I. Lenin]

[Abstract] It was observed that tetrazol mixed with sodium tetrazolate burned in a condensed flame exhibiting several specific characteristics: pure tetrazol is easily flammable and burns in nitrogen atmosphere as a result of the breakdown of vapors appearing on the surface of the molten layer. The mixture exhibits an explosive sparking in the molten layer. With sodium tetrazolate content of 35-38% a self-organized combustion process is observed with formation of a spatially dissipative flame structure which is spheroid-shaped and of liquid consistency. This later phenomenon makes it possible for substances to stay long periods of time in the combustion zone, permitting relatively slow endo- and exothermal processes to occur in it. Figure 1; references 6: 4 Russian, 2 Western (both by Russian authors).

7813/9835

CSO: 11841/87



EFFECT OF DEGREE OF HYDROXYLATION OF GAMMA- $\text{Al}_2\text{O}_3$  SURFACE ON NATURE OF  $\text{TiCl}_4$  CHEMOSORPTION

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 10, Oct 86  
(manuscript received 21 May 85) pp 2277-2280

[Article by L.I. Petrova, A.A. Malkov and A.A. Malygin, Leningrad Technologic Institute imeni Leningrad Soviet]

[Abstract] A study of the effect of the degree of hydroxylation of a gamma- $\text{Al}_2\text{O}_3$  surface on the chemical composition and structure of surface groups forming during its interaction with  $\text{TiCl}_4$  vapors used highly-dispersed gamma- $\text{Al}_2\text{O}_3$  (0.2-0.4  $\mu\text{m}$  fraction) with specific surface 190  $\text{m}^2/\text{g}$  and mean pore radius 3.4 nm. Annealing the aluminum oxide in a nitrogen current at 200-800° to a constant mass removed physically adsorbed water and dehydroxylated its surface. Interaction of  $\text{TiCl}_4$  vapors and aluminum oxide was studied at 200° in a flow reactor. Titanium and chlorine levels were analyzed and the specific surface was measured for low-temperature adsorption of air. The number of OH-groups on the aluminum oxide surface at different temperatures was determined gravimetrically. Values of the degree of hydration of the surface approximate the values found in the literature. Electrophilic interaction of the  $\text{TiCl}_4$  with proton-donor centers of the surface occurred on the gamma- $\text{Al}_2\text{O}_3$  surface in the entire range of temperatures studied. The degree of use of surface hydroxyl groups in the chemisorption reaction did not exceed 40 percent right up to 600° but then increased to 83 percent, probably because of intensification of the proton-donor capacity of the gamma- $\text{Al}_2\text{O}_3$  OH-groups in the process of reconstruction of its surface. Reduction of the degree of hydroxylation and structural reconstruction of the gamma- $\text{Al}_2\text{O}_3$  surface reduced the quantity of chemisorbed  $\text{TiCl}_4$  and changed the composition of the forming surface titanoxychloride structures. Figure 1; references 15: 10 Russian, 5 Western.

2791/9835  
CSO: 1841/39

**INTERNAL CATION-RADICAL SALTS OF TETRATHIAFULVALENE CARBOXYLIC ACIDS:  
SYNTHESIS AND PROPERTIES**

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 22, No 11, Nov 86  
(manuscript received 6 Dec 85) pp 2372-2376

[Article by Ya.N. Kreytsberga and O.Ya. Neyland, Riga Polytechnic  
Institute imeni A.Ya. Pelshe]

[Abstract] Internal cation-radical salts of tetrathiafulvalene carboxylic acids were synthesized by oxidation with various chemical agents, such as  $\text{FcBF}_4$ —ferricin tetrafluoroborate—,  $\text{K}_3\text{Fe}(\text{CN})_6$ , or hydrogen peroxide in aceto- or benzonitrile. The resultant internal salts were virtually insoluble in organic solvents, and, on boiling, underwent decarboxylation and reduction to the corresponding tetrathiafulvalenes. IR and UV data on the salts are summarized in tabular form, and a general structural formula is provided to depict the mesomeric nature of the compounds. References 9: 6 Russian, 3 Western.

12172/9835

CSO: 1841/98

UDC 536.7+534.222.2

PHASE DIAGRAM OF CARBON AND ITS SIGNIFICANCE IN COMPUTING DETONATION  
PARAMETERS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 5, No 1, Jan 86  
(manuscript received 20 Nov 84) pp 111-120

[Article by S.A. Gubin, V.V. Odintsov and V.I. Pepekin, Institute of Chemical  
Physics, USSR Academy of Sciences, Moscow]

[Abstract] In shock waves, detonations and other cases of rapid combustion  
in which high temperatures are reached, the decomposition products are in a  
state of thermodynamic equilibrium, and therefore an understanding of carbon  
phase diagrams becomes essential for computing the physical chemical pro-  
cesses that take place. In the present work the history of carbon phase  
diagram development is reviewed. Covered are the development of the concepts,  
the thermodynamic calculation of carbon phase diagrams at high and low pres-  
sures and the relationship between the phase diagrams of carbon and the  
detonation parameters of explosives. Figures 4; references 35: 12 Russian,  
23 Western.

12765/9835  
CSO: 1841/426

UDC 534.222+536.7

POTENTIAL FOR USE OF SHOCK TUBES TO STUDY EXPLOSION PROCESSES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 5, No 1, Jan 86  
(manuscript received 7 Mar 85) pp 121-128

[Article by B.Ye. Gelfand, A.N. Polenov, S.M. Frolov and S.A. Tayganov,  
Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] A discussion on the use of shock tubes to study explosion  
processes cites previously published examples which are used to demonstrate

the use of these tubes in studying gas dynamics in high and low pressure chambers and various tube lengths. These tubes make it possible to model the conflagration of reacting systems at evenly increasing or decreasing gas temperatures behind a shock wave front. Figures 4; references 18: 10 Russian, 8 Western.

12765/9835

CSO: 1841/426

STRUCTURE AND PROPERTIES OF ALKYLPEROXIDE RADICALS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 5, No 4, Apr 86  
(manuscript received 22 Jan 85) pp 479-483

[Article by A.F. Dmitruk, L.I. Kholoimova, V.I. Krinichnyy, O.Ya. Grinberg, V.F. Shuvalov and Ya.S. Lebedev, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] Peroxide radicals are the main intermediate particles in many organic oxidation processes with molecular oxygen both in living and non-living nature. While much material has been accumulated on the reactivity of peroxide radicals in elementary oxidation reactions, there is considerably less on the structural and electronic properties of peroxide radicals. This makes spectral identification of these radicals while studying radical reaction mechanisms difficult. In the present work a quantum-chemical and radio-spectroscopic study was made of the effects of various alkyl substituents in peroxide radicals on the geometric structure, thermodynamic parameters, enthalpy of formation, ionization potentials, electronic affinity and g-tensors. The data were correlated and the 2-mm range of EPR-spectra was experimentally determined for the  $g=x=x$  component of the g-tensor. The feasibility of peroxide radical identification of EPR-spectra in the 2 mm range when studying the mechanism of oxidation and other radical reactions was demonstrated. Figures 3; references 11: 3 Russian, 8 Western.

12765/9835

CSO: 1841/563



INFRA-RED LASER PHOTOLYSIS OF  $(CF_3)_3CI$  PRODUCTION OF HIGH CONCENTRATIONS OF RADICALS  $(CF_3)_3C$ 

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2: KHIMIYA in Russian  
Vol 27, No 5, Sep-Oct 86 (manuscript received 20 Sep 85) pp 470-473

[Article by V.N. Bagratashvili, V.N. Burimov, S.I. Ionov, F.N. Putilin,  
A.P. Sviridov and I.M. Turovets, Department of Physical Chemistry]

[Abstract] An experimental study of the kinetics of multiphoton dissociation of  $(CF_3)_3CI$  molecules by photoionization diagnosis and of the kinetics of formation of intermediate products,  $(CF_3)_3C$  radicals, by use of kinetic absorption spectroscopy is described and discussed. Infra-red laser photolysis of the  $(CF_3)_3CI$  molecules produced nearly 100 percent yield of  $(CF_3)_3C$  radicals without their fragmentation. The procedure requires performance of infra-red photolysis at sufficiently low pressure during which the radicals being generated do not become heated in collisions with  $(CF_3)_3CI$  molecules overexcited by vibration and the  $(CF_3)_3C$  radicals initially possess an energy at which the rate of their disintegration is much less than the rate of their external cooling. Figures 2; references 8: 6 Russian, 2 Western.

2791/9835

CSO: 1841/60

STUDY OF INTERACTION OF SODIUM FLUOROSILICATE AND TITANIUM DIOXIDE

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 10, Oct 86  
(manuscript received 2 Feb 85) pp 2267-2272

[Article by B.P. Kulikov, S.P. Istomin, V.A. Yakovenko, V.N. Bunkov,  
I.T. Guldin and M.I. Oleynikova, Irkutsk Branch, All-Union Scientific  
Research and Design Institute of Aluminum, Magnesium and Electrode Industry]

[Abstract] The study, performed by the use of thermogravimetry combined with high-temperature roentgenography and chemical analysis of products of interaction of the reagents, used sodium fluorosilicate (a chemical industry waste) with 98.0 percent level of the basic substance and chemically pure titanium dioxide. Interaction of the sodium fluorosilicate and the titanium dioxide proceeded according to the following sequence: at 500°, decomposition of sodium fluorosilicate begins and this is the only reaction in the system up to 580°. At temperatures above 580°, fluoridation of the titanium dioxide by silicon tetrafluoride occurs in parallel with decomposition of the sodium fluorosilicate with formation of  $TiF_3$ . Interaction of  $TiF_3$  and sodium fluoride in the mixture yielded  $Na_3TiF_6$ . The process may be represented by the following equation:  $10Na_2SiF_6 + 4TiO_2 \rightarrow 4Na_3TiF_6 + 3SiO_2 + 8NaF + 7SiF_4 + O_2$ . Figures 4; references 11: 10 Russian, 1 Western.

2791/9835  
CSO: 1841/39

## PHOTOCONDUCTANCE AND LUMINESCENCE OF SINTERED LAYERS OF ZnS

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 44, No 1, Jan 86  
(manuscript received 8 Oct 84) pp 47-51

[Article by A.M. Pavelets, G.A. Pashchenko, Ye.A. Salkov and Ye.I. Fridrikh]

[Abstract] Photoelectric and other properties of semiconductors are largely due to point defects in the crystal structure, and broad zone semiconductors such as ZnS are capable of having defects which result in n-type semiconductors. However, before they can be used in solid state applications, the equilibrium conductance of the ZnS must be capable of being varied over a relatively wide range. In the present work a study was made of an undoped ZnS layer obtained by pulverizing an aqueous suspension of ZnS and then melting it onto an inert ceramic substrate, followed by sintering. Sintering at low but above equilibrium vapor pressures results in a material having the same photoelectric and photoluminescent properties as that obtained by prolonged secondary sintering or remelting Zn in ZnS single crystals. Some assumptions are presented on the nature of the structural changes that take place in the ZnS layers as a result of the cooling conditions. Figures 2; references 11: 8 Russian, 3 Western.

12765/9835

CSO: 1841/438

UDC 666.98+546.185

## EFFECT OF HEAT TREATMENT ON ELECTRO-CONDUCTIVITY OF COPPER PHOSPHATE COMPOSITIONS WITH CARBON FIBERS

Minsk VESTSI AKADEMII NAVUK BSSR: SERYYA KHIMICHNYKH NAVUK in Russian  
No 5, Sep-Oct 86 (manuscript received 20 Feb 86) pp 39-43

[Article by V.V. Samuskevich, N.Kh. Belous and I.N. Yermolenko, Institute of General and Inorganic Chemistry, BSSR Academy of Sciences]

[Abstract] Heat treatment was carried out in air, in an inert gas (helium) and in a vacuum (10 gPa) at 150-600 °C under isothermic conditions. Heat treatment in air or in helium decreased the specific volumetric electrical conductivity 3-4 fold whereas such treatment in a vacuum increased electrical conductivity by one order of magnitude. The differences in electrical conductivity were due to reduction of the copper oxide by the carbon fiber in a vacuum with formation of metallic copper. Compositions heat-treated in a vacuum had greater water resistance and lower temperature coefficient of resistance than samples treated in air or in helium. Heat treatment makes it possible to produce electro-conducting articles which are resistant to storage and which can be used in damp areas and also improves the basic

electrophysical characteristics of the items. Uninsulated articles produced by this method maintained their physical and mechanical and electrophysical characteristics after 300 hours of operation.

2791/9835

CSO: 1841/59

UDC 541.17:541.127:547.211'314.2:546.26-162

#### EPITAXIAL GROWTH OF DIAMOND FROM BINARY METHANE-ACETYLENE MIXTURE

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 5, Sep-Oct 86  
(manuscript received 11 Oct 85) pp 1244-1245

[Article by L.M. Borodina and P.A. Tesner, All-Union Scientific Research Institute of Natural Gases, Moscow]

[Abstract] A study is presented of the epitaxial growth of diamond upon thermal decomposition of a methane-acetylene mixture at atmospheric pressure. Experiments were performed in a quartz reactor with  $d=12$  mm at  $650^{\circ}\text{C}$ , gas flow rate  $700\text{ cm}^3/\text{min}$ , contact time 12 seconds. A diamond powder charge of 200 mg was used and all measurements were performed on the same synthetic diamond powder with specific surface  $31\text{ m}^2/\text{g}$ . The rate of epitaxial growth was measured upon treatment of the diamond powder in methane, in a helium-acetylene mixture and a methane-acetylene mixture. The growth rate from acetylene and the methane-acetylene mixture was found to follow a first order equation. The experimental points for methane-acetylene are on a straight line, reflecting the additive nature of the process. The growth of pyrocarbon is limited by the formation of seeds and its rate is determined by the product of the rate of the processes of formation and growth of crystals. The growth of a diamond single crystal layer is apparently not limited by the formation of seeds and occurs independently from each hydrocarbon. Figure 1; references 8: 6 Russian, 2 Western.

6508/9835

CSO: 1841/115

## PHYSICOCHEMICAL PROCESSES IN SOLID PHASE STRONTIUM TITANATE SYNTHESIS

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 31, No 12, Dec 86  
(manuscript received 28 Mar 85) pp 3026-3029

[Article by L.A. Kvichko, L.A. Kotok, R.F. Ramakayeva and N.P. Shimanskaya,  
All-Union Scientific Research Institute of Monocrystals)

[Abstract] Studies were conducted on the physicochemical aspects of the solid phase reaction  $\text{SrCO}_3 + \text{TiO}_2 \rightarrow \text{SrTiO}_3 + \text{CO}_2$ , to determine factors favoring synthesis of strontium titanate with desirable granulometric characteristics. Evaluation of the kinetics of the reaction and of the effects of the particle size of the reactants over a temperature range of 900-1300°C demonstrated the dependence of  $\text{SrTiO}_3$  granules on the specific surface area of  $\text{TiO}_2$ . Conversion data for equimolar concentrations of the reactants for the synthesis of  $\text{SrTiO}_3$  are summarized in relation to the characteristics of  $\text{TiO}_2$  and  $\text{SrCO}_3$ . The information gained in this manner may be used for selective synthesis of  $\text{SrTiO}_3$  using the solid phase approach. Figures 4; references 13: 11 Russian, 2 Western.

12172/9835

CSO: 1841/103

UDC 541:66-548:537.226.4

OPTICAL PHASE ANALYSIS OF  $\text{Bi}_2\text{WO}_6$ - $\text{Bi}_2\text{MoO}_6$ 

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 31, No 12, Dec 86  
(manuscript received 28 Mar 85) pp 3110-3113

[Article by A.P. Leonov, V.I. Voronkova, S.Yu. Stefanovich, R.R. Shifrina and V.K. Yanovskiy, Scientific Research Physicochemical Institute imeni L.Ya. Karpov]

[Abstract] Nonlinear optical phase analysis and IR spectroscopy of the  $x\text{Bi}_2\text{WO}_6$ -(1-x) $\text{Bi}_2\text{MoO}_6$  system demonstrated the absence of continuity in the solid solutions, pointing to the existence of low-temperature solid solutions with a polar rhombic structure. Single phase boundaries were found at  $x = 0.7$  and  $x = 0.92$ . The lack of isostructural features in  $\text{Bi}_2\text{WO}_6$  and  $\text{Bi}_2\text{MoO}_6$  were attributed to differences in the stereochemical activity of the Bi ions because of the presence of an unshared electron pair on  $\text{Bi}^{3+}$ , in view of the crystallochemical similarity between Mo and W. The greater optical activity of  $\text{Bi}_2\text{MoO}_6$  was attributed to the greater anisotropy of the Bi-O bond lengths in the molybdate in comparison with the tungstate. Figures 3; references 18: 8 Russian, 10 Western.

12172/9835

CSO: 1841/103



PHASE EQUILIBRIA IN  $\text{Ho}_2\text{O}_3$ -VO SYSTEM AT 1400°C

Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 31, No 12, Dec 86  
(manuscript received 2 Dec 85) pp 3128-3134

[Article by A.O. Okot, A.K. Molodkin, Yu.E. Bogatov and R. Manuel Mata,  
People's Friendship University imeni Patrice Lumumba]

[Abstract] A variety of physicochemical methods were employed in a study on the phase equilibria of  $\text{Ho}_2\text{O}_3$ -VO system at 1400°C. The collated data supported the formation of  $5\text{VO}\cdot\text{Ho}_2\text{O}_3$  in the binary system.  $5\text{VO}\cdot\text{Ho}_2\text{O}_3$  represents an orthorhombic perovskite-type crystal with  $a_0 = 5.267 \text{ \AA}$ ,  $b_0 = 5.592 \text{ \AA}$ ,  $c_0 = 5.592 \text{ \AA}$ , and  $a V_0 = 7.570 \text{ \AA}$ , and  $a V_0 = 223.0 \text{ \AA}^3$ . Porous tablets of polycrystalline samples were used for determination of electrical resistance and magnetic susceptibility, with the results summarized in tabular form. Figures 4; references 17: 14 Russian, 3 Western.

12172/9835  
CSO: 1841/103

UDC 546.24

## MECHANISM OF REACTION OF HIGHLY PURIFIED TELLURIUM WITH QUARTZ GLASS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 3, Nov 86  
(manuscript received 7 Feb 86) pp 655-657

[Article by A.A. Titov, M.F. Churbanov, N.L. Opolchenova, V.S. Kutsev,  
L.B. Kuzmin, and Z.V. Yermenko, State Scientific Research and Design  
Institute of Rare Metal Industry, Moscow]

[Abstract] Reaction mechanism of highly purified tellurium with quartz glass was investigated by high temperature mass spectrometry, IR-spectroscopy and X-ray diffraction analysis. It was shown that, reacting with quartz glass, tellurium forms surface compounds which upon evaporation in a mass spectrometer under high vacuum dissociate with formation of  $(\text{Te}_2\text{O}_8)^+$  slivers. In an isothermal mode their intensity diminishes with time, indicating the breakdown of these surface compounds. Thermodynamic conditions for the reaction of tellurium with oxygen in quartz glass are more favorable than one could expect from the theoretical calculations. Thus, the glass surface breaks down and leads to contamination of tellurium with quartz and various impurities in it. Figures 2; references 5: 4 Russian, 1 Western.

7813/9835  
CSO: 1841/97

CRYSTALLINE STRUCTURE AND PROPERTIES OF  $\beta\text{-HoC}_2\text{O}_4\text{F}\cdot 4\text{H}_2\text{O}$ 

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 3, Nov 86  
(manuscript received 10 Jul 86) pp 627-631

[Article by M.R. Kizhlo, A.S. Kanishcheva, Yu.N. Mikhaylov, G.Ya. Pushkina, F.M. Spiridonov, I.V. Arkhangelskiy and L.N. Komissarova, Moscow State University imeni M.V. Lomonosov, Institute of General and Inorganic Chemistry imeni N.S. Kurnakov, USSR Academy of Sciences, Moscow]

[Abstract] Synthesis of  $\beta\text{-HoC}_2\text{O}_4\text{F}\cdot 4\text{H}_2\text{O}$  (I) monocrystals is described and its crystalline structure investigated. Crystals were obtained by diffusion of  $\text{Ho}(\text{NO}_3)_3$  and  $\text{NaF-Na}_2\text{C}_2\text{O}_4$  solutions in polyvinyl alcohol gel in a U-tube; crystalline material began to form in 4-5 days and the process was completed in 2-3 weeks. It was shown that I crystallized in monoclinic syngony with a skeletal structure. Holmium atoms are located on a dual axis with coordination number 8. An F ion bridge has been identified in this skeletal structure which binds the metal atoms; this is a novel property in the field of halogen oxalates. Figure 1; references 6: 2 Russian, 4 Western.

7813/9835  
CSO: 1841/97

UDC 621.792.3

STUDIES ON  $\text{TaUS}_3$  AND  $\text{NbUS}_3$  NEAR CURIE POINT

Tbilisi SOOBASHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 124, No 1, Oct 86 (manuscript received 12 Nov 85) pp 85-88

[Article by P.V. Nutsunidze, V.I. Cherchernikov, Z.B. Chachkhiani and V.K. Slovyanskikh, Georgian Polytechnical Institute imeni V.I. Lenin]

[Abstract] An analysis was conducted on selected thermodynamic coefficients of  $\text{TaUS}_3$  and  $\text{NbUS}_3$  at 100 to 120 K, representing values close to the Curie point, in 8 kOe magnetic fields. The magnetic behavior of both compounds under these conditions, in analogy to alloys of 3d transition metals, met the criteria for magnetic transformation. Changes in the heat capacities of  $\text{TaUS}_3$  and  $\text{NbUS}_3$  were  $49 \times 10^{-4}$  and  $47 \times 10^{-4}$  cal/g·deg. Figures 4; references 6 (Russian).

12172/9835  
CSO: 1841/95

UDC 541.147+547.556.7

PHOTOSENSITIVITY AND ELECTRON STRUCTURE OF 4-SUBSTITUTED BENZOLDIAZONIUM IONS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 10, Oct 86  
(manuscript received 10 May 85) pp 2400-2404

[Article by V.E. Kampar and Z.P. Bruvers, Riga Polytechnic Institute]

[Abstract] Calculations of benzyldiazonium ions were carried out in order to establish the interrelation between the quantum yield of photolysis and the electron structure and results obtained were compared with quantum yields of corresponding benzyldiazonium salts. Quantum yield of photolysis of 4-substituted benzoldiazonium ions by an S<sub>1</sub>-mechanism increased with the decrease of the order of the ruptured C-N bond in the excited state, indicating dissociation in the electron-excited state. Figures 3; references 15: 7 Russian, 8 Western.

2791/9835  
CSO: 1841/57

UDC 547.244

SYNTHESIS OF 1-ARYL-o- AND m-CARBORANES BY REACTION OF 1-o- AND m-CARBORANYL COPPER WITH ARYLDIAZONIUM BOROFUORIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 10, Oct 86  
(manuscript received 20 Nov 85) pp 2316-2320

[Article by A.I. Kovredov, Zh.S. Shaugumbekova, V.A. Kazantsev and  
L.I. Zakharkin, Institute of Heteroorganic Compounds imeni A.N. Nesmeyanov,  
USSR Academy of Sciences, Moscow]

[Abstract] A study of the reaction of 1-o-carboranyl copper and  $\text{PhN}_2\text{BF}_4$  to find optimum conditions of synthesis of 1-aryl-o- and m-carboranes showed that results of the reaction depend upon the halogen in the  $\text{CuX}$  ( $\text{X}=\text{Cl}$ ), the solvent, the ratio of the reagents and the temperature, to some extent. The possibility of producing 1-aryl-o- and m-carboranes by the reaction of 1-o- and m-carboranyl copper and aryldiazonium borofluorides was confirmed and discussed. References 19: 13 Russian, 6 Western.

2791/9835  
CSO: 1841/57

UDC 547.979.733

METHOD OF STUDY OF COBALT PORPHYRIN COMPLEXES IN ALKALINE MEDIUM

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNLOGIYA in Russian Vol 29, No 9, Sep 86 (manuscript received 8 Feb 85)  
pp 114-115

[Article by L.P. Shormanova, G.Ye. Nikitina, S.N. Pobedinskiy and O.I. Koyfman,  
Department of Organic Chemistry, Ivanovo Chemical Engineering Institute]

[Abstract] Chemical stability of cobalt complexes with tetraphenylporphyrin and tetra-(p-methoxyphenyl)-porphyrin in alkaline (7.5 M KOH) solution was investigated. It was shown that storage of these complexes in this KOH

solution for up to 6 months showed no effect on their optical density or ESP spectra. Evidently, the reported instability of such catalysts used over oxygen electrodes is due to accumulation of hydrogen peroxide formed from the discharge of electric current. Figure 1; references 2 (Russian).

7813/9835

CSO: 1841/109

UDC 547.421.5+547.21.279

# SYNTHESIS OF BIS-(BETA-HYDROXYNAPHTHYL)-1,1-SELENIDE AND SOME OF ITS CONVERSIONS

Baku DOKLADY AKADEMII NAUK AZERBAYDZHANSKOY SSR in Russian Vol 41, No 12, Dec 85 (manuscript received 21 Sep 84) pp 36-38

[Article by F.G. Gasanov, M.M. Guseynov, corresponding member AzSSR Academy of Sciences, I.M. Akhmedov, N.D. Goliyev and N.B. Mutallimova, Institute of Organochlorine Synthesis, AzSSR Academy of Sciences]

[Abstract] Results of the reaction of bis-(beta-hydroxynaphthal)-1,1-selenide with ethylene- and propylene-chlorohydrin, acetic and maleic anhydride, acid chloride of acrylic acid and malonic acid are presented and discussed. Synthesis of bis-[beta-(2-hydroxy-ethoxynaphthyl)-1,1-selenide and [beta-(2-hydroxynaphthyl)-1,1-selenide was carried out by condensation of bis-(beta-hydroxynaphthyl)-1,1-selenide with ethylene- and propylene-chlorohydrin in the presence of an equimolar quantity of sodium hydroxide in a solution of 1,4-dioxane. This reaction produced 60 percent and 65 percent ether alcohol yields. Bis-beta-hydroxynaphthyl)-1,1-selenide also reacted readily with anhydrides and acid chlorides of acetic acid, maleic acid; acrylic acid and malonic acid with formation of corresponding esters with 50-55 percent yields. Structure and purity of the products obtained were confirmed by element analysis and infra-red spectroscopy. References 4: 3 Russian, 1 Western.

2791/9835

CSO: 1841/42



PESTICIDES

UDC 547.551.43 + 541.515 + 581.132.1

SYNTHESIS OF PARAMAGNETIC ANALOG OF DIURONE HERBICIDE AND ITS ACTION ON  
PERFORMANCE OF PHOTOSYNTHETIC APPARATUS IN PLANTS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 2, Nov 86  
(manuscript received 11 Oct 85) pp 357-360

[Article by N.A. Buina, N.N. Vylegzhanina, Yu.M. Ratushnyak, N.L. Loseva,  
I.A. Nuretdinov and V.Ye. Petrov, Institute of Organic and Physical  
Chemistry imeni A.Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences]

[Abstract] Synthesis of diurone analogs is reported and its mechanism of action was investigated. Its herbicidal properties are related to selective action on the photosynthesis of green plants and algae. Spin-tagged diurone derivatives were obtained by reacting 3,4-dichlorophenyl-isocyanate with N-(1-hydroxy-2,2,6,6-tetramethylpiperidine)-N-methylamine: N'-(3,4-dichlorophenyl)-N<sup>2</sup>-methyl-N<sup>2</sup>-(1-hydroxy-2,2,6,6-tetramethylpiperidine)-urea (TEMPOD) and N'-(3,4-dichlorophenyl)-N<sup>2</sup>-methyl-N<sup>2</sup>-(2,2,6,6-tetramethylpiperidine)-urea (TMPM). Activity of these agents was evaluated on chlorella and chloroplasts. All agents led to decreased photosynthesis by inhibiting electron transport, but the degree of this effect varied. TEMPOD was shown to have two localization sites: polar and hydrophobic; it can be used effectively in studies of the mechanism of photosynthesis and in evaluating herbicidal properties. Figures 3; references 5: 2 Russian, 3 Western.

7813/9835

CSO: 1841/113

## PETROLEUM PROCESSING INDUSTRY

### NEW ALL-UNION STANDARDS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 10, Oct 86  
p 24

[Article by L.V. Perepechenova and V.G. Shumovskiy, Groznyy Scientific Research Institute]

[Abstract] This article is titled: "All-Union Standard 38.01368-84.--A system of production quality indicators.--Alkylbenzene.--List of indicators." This standard establishes an optimum list of quality indicators for all kinds of alkylbenzenes. Alkylbenzenes are to be classified as alkylbenzene for automobile and motor vehicle engines and those for standard fuels. Requirements for certification of alkylbenzenes are presented. Appendices present terms used in the standard and an explanation of them, an alphabetized list of quality indicators and a list of methods of testing alkylbenzenes. A second standard is titled: "All-Union Standard 38.01369-84.--A system of production indicators.--Cracking catalysts.--List of indicators." This general-technical standard establishes optimal nomenclature of quality indicators of cracking catalysts. Cracking catalysts are classified as ball and microspherical catalysts while catalyst cracking promoters are classified separately. Requirements for certification of cracking catalysts and promoters are discussed. The order and frequency of checking quality indicators of specific brands of catalysts are established. A glossary of terms used in the standard, an alphabetical list of quality indicators and a list of methods for testing cracking catalysts are included.

2791/9835

CSO: 1841/63

## NEW MOTOR OIL M-16Dr

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 86  
pp 9-10

[Article by V.D. Reznikov, L.S. Ryazanov, V.D. Moiseyev, V.I. Vorozhikhina and P.F. Yurchenko, deceased, All-Union Scientific Research Institute Petroleum Production; Industrial Association, Kolomenskiy Zavod]

[Abstract] Characteristics of a new standardized motor oil, M-16DR, for use in trunk-piston diesel engines are presented and discussed. The oil consists of a high quality base and balanced composition of additives containing synergistic combinations of detergents and anti-oxidants and a heat-resistant ash-free dispersant. Tests and assessment of the motor oil are described and discussed. Good results obtained from the tests justified certification of the oil for use in ChN 26/26, DN 23/30 and ChN 30/38 type engines. The oil has high-detergent, dispersive-stabilizing, anti-wear and anti-corrosion properties which ensure reliable operation of engines for 2500 hours or longer. Figures 1; references 2 (Russian).

2791/9835  
CSO: 1841/36

UDC 541.18.537

## DIELECTROPHORETIC DEPOSITION OF DISPERSED PHASES FROM HYDROCARBON MEDIA

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 11, Nov 86  
pp 23-25

[Article by Yu.F. Deynega, A.V. Lobastova, L.N. Demchenko and V.V. Ratushnyak, Institute of Colloid Chemistry and Water Chemistry imeni A.V. Dumanskiy, UkSSR Academy of Sciences]

[Abstract] An explanation of the role of polarization phenomena in removal of impurities (suspended particles) from hydrocarbon media in an electrical field is presented and discussed. Dielectric parameters and relative electroconductivity of diluted suspensions of natural clayey minerals in non-polar and slightly-polar media were measured in a condenser with coaxial cylinders as a function of the level and degree of hydration of the dispersed phase. The mechanism of removal of the impurities involved addition of water to the hydroxyl-containing phase (sorbent) due to hydrogen bonds and formation of a chain of molecules, along which migration of a proton in the electrical field is possible while exchange of discharges between the particles and the hydrocarbon medium is impeded. Increase of the degree of hydration up to values corresponding to the presence of bound water (12-15 percent) increases particle polarizability significantly. Change of the degree of hydration of

the dispersed phase during electropurification of petroleum products can intensify electrocoagulation of impurities due to the effect of hydration polarization and increase the efficiency of the process. Figures 3; references 5 (Russian).

2791/9835  
CSO: 1841/36

UDC 547.313.2.002.2

#### ETHYLENE PRODUCTION: REVIEW OF CURRENT STATUS AND FUTURE POTENTIAL

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 6, Nov-Dec 86  
(manuscript received in final form 28 Jun 86) pp 3-13

[Article by V.M. Dmitriyev]

[Abstract] Soviet and (largely) Western literature is reviewed on the current status and future prospects for ethylene production. Consideration is given to the existing thermal cracking technology as it applies to ethane, propane, butane, naphtha and refinery off-gases in the production of ethylene. Novel improvements and innovations in the process are noted, as well as the fact that at least for the next decade the gasoline fractions will constitute the primary feedstock in the USSR. New plants for the production of ethylene have been established in the Ukrainian SSR in Kalusha and Lisichansk in cooperation with Czech and IRG firms. However, the construction of new plants in the USSR entails considerable economic risks in view of the uncertainty as to the availability of feedstocks. Nevertheless, more efficient plans ensure greater cost effectiveness and improve the environmental situation. References 47: 16 Russian, 31 Western.

12172/9835  
CSO: 1841/100

#### PUBLICITY--GLASNOST--AGAINST BUREAUCRATIC INERTIA (PLEA FOR ACTION)

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Nov 86 p 4

[Article by Department of Heavy Industry "Socialist Industry" Unified Editorial Board of Social Economic Development and Scientific Technical Progress TASS]

[Abstract] Attempts to attract broad public attention to problems impeding acceleration of Tyumen petroleum production have been somewhat successful but significant problems remain. Socialist Industry and TASS journalists journeyed many 1000's of kilometers through this oil region, contacting workers, specialists, directors of subdivisions and others and discussed

production problems with them. Two major problems are the need for drilling equipment with heating systems and the unreliability of electricity supply. Measures are being taken to remedy these and other production bottlenecks. Problems relating to continued lethargy and inertia in relation to the Tyumen situation are being attacked.

2791/9835

CSO: 1841/72

UDC 553.981.002.3(575.4)

PROSPECTS OF DEVELOPMENT OF RAW MATERIAL BASE AT GAS-CHEMICAL COMPLEX IN  
GISSAR GAS-BEARING REGION OF EASTERN TURKMENISTAN

Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR: SERIYA FIZIKO-  
TEKHNICHESKIKH KHIMICHESKIKH I GEOLOGICHESKIKH NAUK in Russian No 4,  
Jul-Aug 86 (manuscript received 27 Aug 84) pp 69-74

[Article by A.A. Abdyyev, S.Sh. Batyrov and M. Khalylov, Turkmen Scientific  
Research and Design Branch of All-Union Scientific Research Institute of  
Gas]

[Abstract] Evidence supporting the premise that the Gissar gas-bearing region in Eastern Turkmenia shows promise of being a base region for natural gas and petroleum extraction is presented and discussed. Specific features concerning zones of occurrence of natural gas components (ethane-butanes, condensate, hydrogen sulfide) are presented. Primary sites for deep drilling are discussed and geological prospecting studies aimed at development of the raw material base of the Gissar Gas-chemical Complex and for the region as a whole are discussed. A diagram of prognosis of distribution of ethane and potential level of condensate in gases of the upper Jurassic complex of the Gissar region and a diagram of hydrogen sulfide distribution in gases of the upper Jurassic carbonate complex of the region are presented and described in some detail. Figures 2; references 6 (Russian).

2791/9835

CSO: 1841/44



## POLYMERS AND POLYMERIZATION

### USSR SYNTHETIC POLYMER INDUSTRY

Moscow KRASNAYA ZVEZDA in Russian 16 Aug 86 p 4

[Article by Doctor of Technical Sciences Mikhail Lazarevich Fridman: "The Many-Sided World of Polymers; Science and Engineering in the March of the Five-Year Plan"; first three paragraphs are KRASNAYA ZVEZDA introduction]

[Text] Humanity has been involved with the world of polymers for a long time, although it became aware of it comparatively recently. Natural rubber, cotton, wood, resins and bitumen--all these and many others have entered our life. But the twentieth century has been concerned about radically updating the scope of the meaning of "polymer". We are rather more accustomed for it to mean synthetically obtained plastics, chemical fibers, and electrical insulating materials...

Today, industry produces about 700 different kinds of plastics products, which include 6,000 items.

The editorial staff asked Doctor of Technical Sciences Mikhail Lazarevich Fridman, chief of the Laboratory for the Synthesis, Processing, and Use of Composite Materials of the Plastics Scientific Research Institute of the Plastmassy Scientific Production Association to discuss trends and outlooks for the development of synthetic polymers.

The basic directions of economic and social development of the USSR adopted by the 27th CPSU Congress specify a whole set of measures for accelerating the development of polymer materials and increasing their production. As early as 1990, it is planned to reach a synthetic resin and plastics output of 6.8-7.1 million tons, a chemical fiber and filament output of 1.85 million tons, and a synthetic rubber output of 2.7-2.9 million tons. As an absolute figure, it is, of course, considerably less than the reference figure for metals; however, the absolute figures say far from everything. In particular, they "omit" the fact that polymers successfully displace in homes and in production those same metals and their alloys, paper, and ceramic products. Indeed, a kilogram of polymers sometimes saves 5-10 kilograms of heavier materials. And it would not be surprising if in the near future, polymers could advance to first place.

Some specific figures: the total world production of plastics already is measured in tens of millions of tons. In the long run, this production will be comparable in weight with the production of steel, but in volume, it will surpass it by more than a factor of 2.

It can be confirmed that now the volume of output, processing, and consumption of plastics has become one of the most important indicators of the economics of the country and the level of technology, and if you would like, also sciences and engineering as a whole.

In 1966, an average of 17.5 cubic decimeters of metals and 6.7 cubic decimeters of plastics were produced for each inhabitant of the planet. In 1983, the production of both was 25 cubic decimeters, and for 2000 A.D., economists forecast a yield at a limit of production of 41 cubic decimeters of metals and 233(1) cubic decimeters of plastics for each inhabitant of the earth.

The grandiose USSR Integrated Program of Scientific and Technical Progress specifies a substantial jump in volumes of output and the quality of plastics and composite materials based on them for Comecon members in the next 15 years.

This is a command of time and a pledge to accelerate scientific and technical progress in a great number of other branches of industry and agriculture. Electrical engineering and radioelectronics without polymer electrical insulation, not even to mention other polymer materials which they require, simply could not exist, and without these two branches, no acceleration of our social and economic development can be achieved.

New materials made of synthetic polymers create premises for a truly revolutionary transformation of science and engineering, of our living conditions and of industrial and agricultural production. This is one of the most important reasons for their triumphal march on the planet. The most graphic example is the mastery of the cosmos. The protective suit of the cosmonaut is not the heavy armor of knights, but a hygienic suit made of many layers of polymer films and durable synthetic fabrics, and synthetic paddings between them. Each cosmic station is a combination of traditional building materials and the newest polymers. If polymers did not exist, any cosmic apparatus would be heavier, for the same effectiveness, by a factor of hundreds or even thousands of kilograms, at the same time losing reliability and operational convenience.

The picture is the same in other branches of human activity also. In the chemical industry, for example, and in branches related to it, pipes, sheets, and films are used, which because of the high mechanical strength and chemical stability can replace metals with a great economic effect. The lining of apparatus, pipelines, and hardware for acid and alkaline media, exhaust gas conduits, valves, pumps, tanks, chemical dishware, units and components of filters and sewage treatment plants, dies and liners for molds, waterproof sealants, and all kinds of adhesives--these are far from a complete enumeration of the products and materials used in the most important branches.

In construction, the use of every thousand tons of plastic pipes in pipeline systems provides an economy of metal of not less than 5,000 tons; of energy resources, not less than 3,000 tons of petroleum equivalent; of labor resources, 16,000 man-days, and of capital outlay, 1.5 million rubles.

For the motor vehicle industry, the low density, the high specific strength, and the thermostability of plastics are especially valuable. Components of control systems, fans, the lining of cabin doors, flexible pipings, the battery casing, filters, and electrical appliances, the panels of dynamic loudspeakers and radio receivers, jack plugs, terminals, upholstery fabrics, mats, coating of fenders, and parts of air conditioners are not a complete enumeration. It is enough to say that already 25 kilograms of plastics are now used in the modern truck; 35 kilograms, in an automobile; and 250 kilograms, in a motor bus. The same trend is characteristic also of agricultural machine buildings. In recent years, polymers have been synthesized purposefully for use in medicine and biology.

And our houses? Our contemporary man lights, heats, and decorates them with filled coverings and carpets, linoleum and carpet runners, lamp shades, ceiling fixtures, shelves, vases, flower pots, and all kinds of toys, which are made of thermoplastic and thermosetting polymer materials. Products made of synthetic leather and clothing made of synthetic and artificial fibers and thread have obtained widest distribution...

The world of polymers is many sided. But all these "compounds", both synthetic and natural, have a common characteristic: their molecules are comprised of tens, hundreds, or thousands of recurrent basic units of simple structure. The properties of the polymers also depend on the number of these simple units in a chain or in a molecular "branch" and on their relative spatial configuration.

Mainly new materials will also be developed in a parallel way to those already widely known. Let us say, electrically conducting plastics enable linoleum heaters to be turned out. It is possible to manufacture wallpaper conditioners out of the same material. Scientists also propose so-called self-extinguishing compositions which work on the principle of foaming and breakdown of the charger, which will not catch fire (and for the plastics, the problems of fireproof safety are extremely important) and will spread and extinguish fire. Magnetically hard and magnetically soft plastics should also be mentioned. The first can be used for different strengthening elements; notebooks for multiple entries can be made of them. Magnetically hard plastics will be used for linear motors.

There is no purpose in further enumerating examples. Polymers, I repeat, are a world without limits, but our century is the first century of the epoch of synthetic polymers, which is only beginning for mankind.

Only one limiting factor--raw materials--exists for the boundaries of this world and for its length of time. Presently, many synthetic polymers, which do not have analogs among natural materials, are obtained from petroleum. More than 3 billion tons of petroleum are extracted per year from the Earth. Futurology sounds the alarm--petroleum reserves are sufficient in all for 25-

40 years! But, in the first place, this refers only to proved reserves, and indeed in the depths of the Earth the petroleum reserves (still unproved) are many times larger. In the second place, 1-2 percent of the petroleum being extracted is consumed in the production of plastics, but the development of alternate energy sources in the next few years will release a considerable amount of petroleum from the unqualified role of "stoker" of the planet. In the third place, the world does not agree on petroleum as the key--other abundant sources of chemical raw materials are at hand: coal, natural gas, wood, carbon dioxide, and silicon-containing compounds.

Thus, a raw material "famine" of polymers is not threatened, but clearly wastefulness here is out of place and harmful, and the development of resource-conserving technologies for obtaining and processing polymers are urgent.

In our country, a whole system of original and progressive energy- and resource-conserving developments has been achieved, a large scientific stockpile of ideas has been created which is working on fulfilling the decisions of the 27th CPSU Congress. The matter boils down to the rapid and broad introduction into practice, and the first steps have already been taken.

12410

CSO: 1841/1



## POLYMER MATERIALS IN MACHINE BUILDING

Moscow KOMMUNIST in Russian 17 Aug 86 p 3

[Interview of Nikolay Sergeyevich Yenikolopov by KOMMUNIST correspondent S. Zheltov under the "Horizons of Science" rubric: "These Different Polymers"; first three paragraphs are KOMMUNIST introduction and capitalized passages are published in boldface]

[Text] "The Basic Directions of the Economic and Social Development of the USSR for the Years 1986-1990 and for the Period up to the Year 2000" specifies, "To Provide Accelerated Development of **Plastics and of Other Polymers of Modern Design**".

Why is so much attention paid to polymers? What are their advantage and national economic importance? The correspondent of the newspaper KOMMUNIST asked the Lenin Prize Laureate Academician Nikolay Sergeyevich Yenikolopov to answer these questions. He is president of the Interdepartmental council on Synthetic Polymer Materials of the Presidium of the USSR Academy of Sciences, president of the Council of the USSR State Scientific and Technical Committee on the Use of Polymer Materials in the National Economy. Academician N. S. Yenikolopov is director of the Institute of Synthetic Polymer Materials of the USSR Academy of Sciences and directs the Section on Polymer and Composite Materials of the Chemical Physical Institute of the USSR Academy of Sciences.

Nikolay Sergeyevich, told about what the scientific collectives are working on, dwelt on the creative ties with Armenian scientists, and shared his thoughts on the role and place of the scientist in the campaign for scientific and technical progress.

We live in a time in which chemistry occupies an important place in the fields of modern human activity, beginning with aviation and ending with medicine and agriculture. It plays a large role in fulfilling the Food Program. Chemistry determines many things...

We basically shall conduct work on the development of new materials with unique properties in the direction of the development of composite materials for building purposes. You know that in the present five-year plan, and, indeed also up to the end of the present century, preference will be given to the development of machine building and computerization. This is the basis



for the development of the whole national economy of the USSR. And if we shall attentively examine what is limiting in the priority directions of development of industry and science, we shall be convinced that the most important thing here is new materials. Why? Because we must build new machines so that they are lighter in weight and have a longer life and greater reliability.

We shall now develop compositions which have unique properties. Especially when one refers to materials having a low specific weight. In particular, organic fibers are being produced. Their strength comprises 450-500 kilograms per square millimeter. In order to make this clear, I shall say that steel-3, which we use ordinarily, has a strength of 25-30 kilograms per square millimeter. If strength is divided by weight, one obtains: in specific strength, the new fibers exceed the best steels by a factor of 40-50. It is also necessary, of course, to build aircraft, motor vehicles, locomotives, and ships made of them.

By having a high specific strength, advanced composite materials are available which are lower in weight and smaller in overall dimensions. Therefore, they basically are used in machine building. These are organic fibers or so-called organoplastics, glass fibers--fiberglasses, carbon fibers--carbonplastics, and their hybrids. They possess different qualities and superior properties. But I must confess that the superior price also costs very dearly. From this come difficulties with the organization of production. Now we are beginning to simplify the technology of the manufacture of such products and to decrease the energy and other expenditures concurrently with an increase in strength, hardness, and reliability. And as the result, to lower the price. They are still expensive, and therefore, we still do not produce enough of them, and we do not produce enough of them because they cost too much. This is the paradox. Only by an increase in production will the price sharply drop. Consumption will increase. These undoubtedly are the materials of the future.

Up to this time I have talked about composites which have exceptionally high strengths and deformation properties. Materials with such a high strength are seldom required in general practice. And here so-called building materials come out in first place. They go into the manufacture of different parts in machine building--for motor vehicles, combines, trucks, and any kind of machine tools. Metal was previously used traditionally in their production. But building compositions are already beginning to show an advantage over them, let us say, in the example of the technology of the manufacture of parts. Metal has to be machined and punched. But polymers can be manufactured by the method of casting or molding. The labor-intensiveness per part on the average decreases by a factor of 10-15. Manpower and machine resources are economized. When we expend fewer man-hours by a factor of 5 and sometimes 50 for the manufacture of a single product, depending on the complexity, this, naturally, becomes very advantageous.

Another important problem is the cheapness and weight of building materials. But we still do not use them enough. I shall not cite many examples and shall give only one. I irreproachably introduced myself to the work of the Don-1500 combine. It is a good combine but very sluggish. And why? Indeed, because basically it has worked with metal. In this connection, we markedly lag

behind capitalist countries. We lag by a factor of 3-4. And not only in the use of building materials, but in general in the production of polymers. Everything is being done now to overcome the lag. But to overtake is always harder.

Therefore, it was necessary to look for another way. In the scientific collectives which I have directed and in the Norplast Scientific-Production Association, work is in progress on the development of new components which are somewhat midway between inorganic and organic substances. There is a whole pleiad of norplasts or kompanors.

About the new technology. We are now concerned with the problem of paper manufacture. The fact is that the treatment of wood and the production of cellulose and paper from it has an ancient history. Today, cellulose and paper are made exactly the same way as they were a hundred years ago. Nothing has been changed in the technology of their manufacture. Machines and technological layouts have been improved. But the principles have remained the same. Therefore, up to this time, 500 tons of water are consumed to make one ton of cellulose. But we no longer can consume fresh water so liberally. We are short of it. The new technology which we are developing will make it possible to decrease water consumption by a factor of 5, and alkali consumption, by a factor of 3-4.

Furthermore. We chemists always had one scourge--the heat of reaction. Much power and energy are expended to remove from the reactor the heat which is given off during a chemical reaction. This makes the technology complex and sluggish, especially with reference to plastics, where there is a viscous medium, poor heat exchange and difficult heat transfer.

Previously it was considered that the larger the reactor, the better and higher the labor productivity. Production rose, and the overall dimensions of the vessels rose. And are such reactors necessary? Now we have come to the conclusion that it is not obligatory to remove heat. It is possible to develop a technology in which heat will remain in the system by increasing the rate of the processes. This enables the reactor volume to be reduced by a factor of 200 and even a thousand and the area of chemical plants to be decreased. In other words, the use of new highly-efficient reactors will make it possible to obtain considerably greater production in smaller spaces. New units are already working at many plants--in Sungait, Yefremov, and Salavat. My students--professors A. Berlin, S. Davtyan, and others--are working especially successfully in this field.

I would like also to dwell on chemical reactions in solids. Since time immemorial, it has been considered that a solid from a chemical point of view is inert because there are no conditions for collision of molecules. This was the absolute formula of all alchemists. It was confirmed that in order for a reaction to take place, it is necessary for the compound either to be converted into the liquid state or to be dissolved. For the last twenty years, our collective has worked on proving that chemical reaction is possible in a solid, if shear reformation [sic] is especially created. Then the molecules begin to react and react a thousand or a million times more rapidly than in a liquid medium.

We are developing many new technologies on this basis. First of all--about pulverization. The particles are bound to each other, and it is necessary to rupture this bond. Man has studied pulverization for a long time. Unfortunately, in our country as well as in other countries, there are no exact statistics on this aspect. We pulverize approximately 2.5 to 3 billion tons of materials per year. We showed that in order to obtain particle size data, we expend a thousand or a million times more energy than is actually required. Let us say, in order to pulverize polymers, we consume 1000-2000 kilowatt-hours of electrical energy per ton, although several kilowatt-hours are sufficient for this, because the efficiency coefficient comprises much less than one percent. All the excess energy is converted into heat and goes to heat the environment. Consequently, one of the most important tasks of science concerning pulverization is to find methods for a drastic decrease in consumption of electrical energy. We have now developed a new pulverization method, elastic deformation, which makes it possible to decrease electrical energy consumption by a factor of 5-10. The method is finding wider and wider use at industrial enterprises of the country, including the ArSSR. Many foreign countries have been interested in it.

By using shear deformation, we are involved in carrying out chemical reactions in a solid. We are obtaining new products, and we are developing new technologies. I think that if not in the current, then in the next five-year plan, we shall obtain products precisely in such a way. A good example of this is the production of paper and cellulose.

In Armenia, several groups under my leadership are concerned with problems of solid-phase reaction. For example, there is such a group at the Yerevan Animal Veterinary Institute (A. Mkhitarian, A. Karagezyan, and others). It seems to me that the direction relates to solid processes which are especially important for Armenia, where there is little water and little energy and a great deal of pollution in the cities.

It was noted at the 27th CPSU Congress that our country is waiting for new scientific discoveries and inventions which provide really revolutionary changes in the development of engineering and technology.

What do I see as the duty of the scientist? I consider the scientist as a person who, most of all, is able to wonder. It is possible to wonder in different ways. From ignorance and from incomplete knowledge. The genuine scientist wonders because he can suddenly perceive a phenomenon which is not given to others to know. It is already a discovery, a wonder from deep knowledge of a subject, and a keen feeling about a new and very rich experiment. A scientist is not an abstract concept. He most of all is a fervent patriot of his native land. He is characterized by eminent citizenship. He always lives by the interests of society and affairs of the people. He cannot be undisturbed both about the economical consumption of our resources and also the conservation of these resources for future generations.

By being concerned with basic scientific problems, the scientist does not rightly stand aside from life and cannot not think of the harmony of their creative searches with the demands of the day and the needs of industry. The

work related to the development of the chemical and petroleum industry. Every basic scientific discovery, if it is truly basic, inevitably leads to revolutionary changes in technology. I want to say that there cannot be a pure scientific discovery which would not be related to a technological revolution. This is the first precept of the true scientist. My teachers Nikolay Nikolayevich Semenov and Aram Bagratovich Nalbandyan taught this. I shall be happy if I succeed in transferring this credo to my own students.

12410

CSO 1841/1



UDC 541.128.13:541.183:542.952.6:541.127:539.16.04:[546.623+546.284-30]:547.431.2

INTERACTION OF EPICHLOROHYDRIN WITH SURFACE OF SILICON AND ALUMINUM OXIDES

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 5, Sep-Oct 86  
(manuscript received 28 Sep 84) pp 1196-1201

[Article by V.N. Doroshenko and A.P. Meleshevich, Institute of Physical Chemistry imeni L.V. Pisarzhevskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] A study is reported of the adsorption of epichlorohydrin on aluminum and silicon oxides and of the specifics of its polymerization under the influence of ionizing radiation. Adsorption isotherms were measured on a thermostated vacuum adsorption installation with a quartz spring-balance at 10-40°C. After irradiation of the specimens, the unreacted monomer was removed in a vacuum and the soluble polymer fraction was extracted 24 hours in boiling toluene. The molecular weight of the polyepichlorohydrin was determined by a cryoscopic method. It is found that the adsorption interaction, mobility and orientation of adsorbate molecules influence the composition of the polymer products, their bound strength with the surface and molecular weight. The formation of complexes of various types, upon adsorption of epichlorohydrin onto the surface of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , causes a change in the monolayer of the relationship of the graft polymer to the homopolymer. In the monolayer, the conformation position is preferable and the limited mobility of the molecules increases the rate of curing of the epichlorohydrin and the formation of the homopolymer. Upon transition to physically adsorbed layers, the influence of the surface is weaker and  $\bar{M}_v$  decreases. Figures 3; references 16 (Russian).

6508/9835  
CSO: 1841/115



## EFFECTS OF METALLIZATION ON STRUCTURAL AND MECHANICAL PROPERTIES OF NITRON FIBERS

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 86  
(manuscript received 29 May 86) pp 39-40

[Article by D.N. Akbarov, A.K. Yenikeeva, L.A. Samoylova and G.V. Mikonovich]

[Abstract] A study of the effects of various levels of Ni (0.68 to 7.8 wt%) on the characteristics of polyacrylonitrile fibers (Nitron; PAN) demonstrated that metallization had marked structural and mechanical consequences. Low levels of Ni (0.68-2.2 wt%) led to a decrease in  $T_g$  from 142°C for the unmetallized PAN to 122-126°C, while a Ni content of 4.7 wt% raised the  $T_g$  to 136°C. The samples with 7.8 wt% Ni had a  $T_g$  of 162°C, exceeding that of the untreated fibers. Furthermore, addition of Ni in increasing concentrations resulted in a proportional enhancement of ultrasonic wave propagation from 2610 m/sec for the control samples to 3218 m/sec for the 7.8 wt% Ni sample. The angle of crystallite divergence increased from 28° for PAN to 32-33° for 0.68-4.7 wt% Ni PAN, and then reversed back to 28° for 7.8 wt% Ni PAN fibers. The effects of Ni on the properties of PAN fibers were attributed to the reaction of the polymeric -CN and -COOH groups with the metal. Figures 1; references 2 (Russian).

12172/9835  
CSO: 1841/88

UDC 534-8:677.464

## MECHANISMS OF ULTRASONIC WAVE PROPAGATION AND QUENCHING IN TEXTILE ACETATE-POLYAMIDE FIBERS

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 86  
(manuscript received 15 Nov 85) pp 40-42

[Article by B.Kh. Yunusov]

[Abstract] A study was designed to evaluate the utility of ultrasonic waves in assessing the structural features of acetate-polyamide blend fibers in a nondestructive manner. Sonication of fibers subjected to various degrees of stretching demonstrated that quenching was largely due to the actual extent of physical contact between the polyamide axial component and the overlapping acetate fiber, which determined the loss of energy. Thus, propagation of the ultrasonic waves proceeded primarily along the main axial polyamide fiber, with the overlapping acetate fibers responsible for dissipation of energy. The acetate-polyamide fibers exhibited unequivocal waveguide characteristics when subjected to pulsatile sonication with 25, 60 or 100 kHz waves. These observations indicate that determination of the degree of quenching and of

propagation of ultrasonic waves may well be a useful and nondestructive method for quality control of man-made textile fibers. Figures 4; references 2 (Russian).

12172/9835  
CSO: 1841/88

UDC 677.494,742-486.32:66.074.2

#### HOLLOW GAS-SEPARATING FIBER GRAVITON

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 86  
(manuscript received 11 May 86) pp 49-51

[Article by Yu.A. Kostrov, G.B. Mostovaya, T.I. Ignatenko,  
A.Ya. Ardashnikov and B.Ya. Khutorskiy]

[Abstract] An extrusion technique was employed for the production of two types of hollow fibers suitable for separating gases. The fibers were produced from poly-4-methylpentene-1 to have wall thicknesses of ca. 13 and ca. 25  $\mu\text{m}$  and wall thickness: external diameter ratios of 1:3 and 1:5. The hollow fibers, designated as Graviton, had operating pressure drops of 1.0- to 3.0 MPa internally and 10-30 MPa externally, and permeability coefficients ( $P \times 10^{13}$ ,  $(\text{cm}^3 \cdot \text{cm})/(\text{cm}^2 \cdot \text{sec} \cdot \text{Pa})$ ) for oxygen, nitrogen and hydrogen of 13-18, 3.5-4.5, and 60-70, respectively. Among its myriad of uses, Graviton fiber has been found effective in resolving mixtures of  $\text{C}_2$  and  $\text{C}_3$  hydrocarbons, and in the concentration of the  $\text{C}_3$  hydrocarbon from a mixture of hydrogen, methane, and  $\text{C}_2$  hydrocarbon. Other potential uses include drug delivery, noise deadening, and filler functions. Figures 1; references 9 (Russian).

12172/9835  
CSO: 1841/88

UDC 677.4.051.12:658.588.8

#### REDUCTION AND HARDENING OF MACHINE PARTS BY PLASMA SPRAYING

Moscow KHIMICHESKIYE VOLOKNA in Russian No 6, Nov-Dec 86  
(manuscript received 17 Jun 86) pp 51-52

[Article by B.A. Kiselev, Ya.M. Surgunt, V.N. Alenkin and A.G. Kresteshnikov]

[Abstract] A method has been developed for ruggedizing machine parts exposed to fibers and cords at the Khimvolokno Mogilev Production Association, based on plasma spraying. The optimal approach consists of spraying the part with a mixture of  $\text{Al}_2\text{O}_3 + \text{TiO}_2$  in an inert gas at 50-150°C. Treatment of the

exposed parts has increased their service life 2.5- to 5-fold in comparison with parts subjected to chrome plating. More extensive application of this technology in the Soviet industry will markedly improve the cost-effectiveness picture of fiber and cord production. References 3 (Russian).

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CSO: 1841/88

UDC 541.15

RADIATION GAS LIBERATION IN SPARSELY CROSS-LINKED COPOLYMERS OF ACRYLIC ACID AND HEXALLYLSACCHAROSE

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 20, No 6, Nov-Dec 86  
(manuscript received 7 Jun 85) pp 501-504

[Article by A.M. Afanas'yev, V.N. Demishev and V.A. Novozhilov, All-Union Correspondence Institute of Machine Building]

[Abstract] A study is presented of the qualitative and quantitative composition of the gaseous products of radiolysis of a copolymer of acrylic acid and hexaallylsaccharose. The specimens studied had a mass content of hexaallylsaccharose in the monomer mixture of 0.8, 1.2, 1.5 or 2.5%, with benzoyl peroxide, 1%, as initiator. Effective viscosity of 0.5% neutralized aqueous dispersions of the copolymer was measured as a function of content of cross-linking agent. Viscosity was found to increase with increasing hexaallylsaccharose content, reaching 0.33 Pa·s at 2.5% HAS. Viscosity was decreased by irradiation up to a dose of 9.2 kGr, particularly with exposure to air. CO<sub>2</sub> liberation decreased in specimens irradiated in the presence of air with increasing HAS content. Greater quantities of methane and ethane were liberated upon bombardment with exposure to air than in a vacuum. The high yields of CO<sub>2</sub> upon irradiation in the presence of air are probably related to chain processes of radiation-chemical oxidative destruction. Figure 1; references 8: 7 Russian, 1 Western.

6508/9835

CSO: 1841/92

## NANOSECOND PULSED RADIATION CONDUCTIVITY OF POLYMERS

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 20, No 6, Nov-Dec 86  
(manuscript received 8 Apr 85) pp 509-514

[Article by A.P. Tyutnev, V.N. Abramov, P.I. Dubenskov, V.S. Sayenko, A.V. Vannikov and Ye.D. Pozhidayev, Moscow Institute of Electronic Machine Building; Institute of Electrochemistry imeni A.N. Frumkin, USSR Academy of Sciences]

[Abstract] Disk polymer specimens 40 mm in diameter cut from commercial film 10-40  $\mu$ m thick and polymer layer specimens cast from solutions on metal substrates were equipped with atomized silver electrodes and bombarded with accelerated electrodes at 8 MeV, in pulses 8 and 40 ns in length, to determine the radiation conductivity of 31 polymers. The radiation-induced conductivity of all specimens was found to be related with the movement of electrons and holes rather than charge carriers, contrary to the Rouse-Fowler-Weisberg theory. The delayed component of conductivity depends in a nonlinear way on electric field intensity. An equation is derived for direct determination of the frequency factor in radiation-induced conductivity from experimental data. Figures 4; references 16: 14 Russian, 2 Western.

6508/9835

CSO: 1841/92

UDC 539.3:678.067:532

## EFFECT OF ULTRASOUND ON SOME POLYOLEFINS

Baku DOKLADY AKADEMII NAUK AZERBAIJZHANSKOY SSR in Russian Vol 41, No 12, Dec 85 (manuscript received 7 Feb 85) pp 26-30

[Article by R.M. Aliguliyev, D.M. Khiteyeva, V.B. Yurkhanov, A.A. Shibayeva, F.I. Dzhumshudov, corresponding member AzSSR Academy of Sciences, and R.A. Babakhanov, AMI [sic] imeni N. Narimanova]

[Abstract] The effect of ultrasound on different classes of polyolefins including polyethylene, synthetic ethylenepropylene elastomer and butyl rubber is described and discussed. Ultrasound (44 kHz) produced highly pronounced changes in the polymers studied, especially a rapid decrease of molecular weight, indicating destruction of macrochains. Formation of macroradicals was regular under the effect of ultrasound on the polymer solutions and their formation depended upon the ultrasound frequency. Figures 1; references 5 (Russian).

2791/9835

CSO: 1841/42

## KINETIC ISOTOPE EFFECT OF LOW TEMPERATURE REACTIONS OF CARBENES IN SOLID POLYMERS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 2, Nov 86  
(manuscript received 21 Jan 86) pp 376-381

[Article by V.V. Korshak, A.P. Vorotnikov, Ye.Ya. Davydov, N.M. Kozyreva, A.I. Kirilin, S.B. Skubina and D.Ya. Ippitygin, Institute of Chemical Physics, USSR Academy of Sciences; Moscow Chemical Engineering Institute imeni D.I. Mendeleev]

[Abstract] Kinetics of thermal destruction of diphenylcarbene and 2,6-tertbutylcyclohexadiene carbene in polymethylmethacrylate and polystyrene with protonated and fully deuterated chains was studied in an attempt to explain the mechanism of carbene reactions in polymer matrices. It was shown that low temperature carbene reactions in a polymer matrix include two parallel processes connected to two spin states: principal triplet and the singlet state. From literature data, a tunnel mechanism was proposed for hydrogen atom transfer to the triplet carbene. However, kinetic isotopic effects appeared to be too low to support this mechanism. According to data obtained in this work, especially at the initial stages of thermal destruction of triplet carbenes, a reaction must be considered based on their transition to the singlet state. Singlet carbene reaction leading to their insertion along the chemical bonds is characterized by an insignificant isotope effect. Figures 3; references 10: 6 Russian (1 by Western author), 4 Western.

7813/9835  
CSO: 1841/113

UDC 678.743.22:541.183.03

## WATER ADSORPTION IN COMPOSITIONS BASED ON POLYVINYLCHLORIDE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 29, No 10, Oct 86 (manuscript received 26 Nov 85) pp 78-81

[Article by A.Ye. Chalykh, A.P. Belokurova, and L.G. Shigobutdinova, Department of Chemical Technology of Plastics and Film Materials, Ivanovo Chemical Engineering Institute; Institute of Physical Chemistry, USSR Academy of Sciences]

[Abstract] Water adsorption was studied in polyvinylchloride plasticized with dioctylphthalate filled with cotton, caprone and lavsone fibers with different hydrophilic properties. Adsorption capacity of the compositions



depended on the nature of the fibers and their hydrophilicity: lavsone lowered water adsorption to the greatest degree, followed by caprone and cotton. A linear relationship was observed between the quantity of adsorbed moisture and the filler content in studied compositions. It was shown that all polar groups in a polymer are not necessarily accessible during the water vapor adsorption process. Figures 3; references 7 (Russian).

7813/9835

CSO: 1841/102

UDC 543.42:542.94:678.74

#### IONIC METAL TRANSFER INTO ETHYLENE COPOLYMER WITH VINYL ACETATE IN ADHESIVE AND FRICTION COMPOUNDS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian Vol 29, No 10, Oct 86 (manuscript received 10 Oct 85) pp 129-132

[Article by A.I. Kuzavkov, A.I. Yegorenkov and N.I. Yegorenkov, Department of General Physics, Gomel State University]

[Abstract] Both in static (adhesion) and in dynamic (friction) contacts of polymers with metals in air at elevated temperatures there occurs a transfer of metal particles in form of carboxylates into the polymer; this is related to contact oxidation reactions. Chemical changes in ethylene-vinyl acetate copolymer in adhesion on friction contacts with copper, lead, zinc and brass surfaces were studied at 328-423 K. It was shown that metal ions were indeed transferred into the copolymer. The accumulation of metallic particles increased with temperature rise. Increasing the duration of thermal treatment resulted in an asymptotic curve which eventually reached a plateau. Metallic particles are transferred in form of carboxylates. Figures 2; references 12: 7 Russian (1 by Western author), 5 Western (1 by Russian authors).

7813/9835

CSO: 1841/102

## RADIATION CHEMISTRY

UDC 541.128:621.375.826

### REACTIONS OF TRIFLUOROMETHYL HYPOFLUORITE WITH VARIOUS ACCEPTORS IN PULSED CO<sub>2</sub>-LASER FIELD

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 5, No 4, Apr 86  
(manuscript received 5 Aug 85) pp 475-478

[Article by Ye.B. Aslanidi, V.T. Zarubin, A.G. Kudziyev and Yu.S. Turishchev, Scientific-Research Institute of Stable Isotopes, Tbilisi]

[Abstract] Multiphoton absorption and dissociation of multiatomic molecules has attracted great interest in research on intermolecular reactions taking place in a strong IR-field from the dual standpoints of isotope separation and getting a clearer understanding of the nature of the observed phenomenon. In the present work a study was made of the reactions of CF<sub>3</sub>OF with hydrogen and methane initiated in the gaseous phase with a pulsed CO<sub>2</sub> laser. It was deduced that this reaction takes place via a chain mechanism, and explanations for the observed phenomena are presented. Figures 4; references 7: 3 Russian, 4 Western.

12765/9835  
CSO: 1841/563

UDC 539.16

### RADIOACTIVE DECAY RATE AND LUNAR SOIL AGE

Leningrad RADIOKHIMIYA in Russian Vol 28, No 3, Mar 86  
(manuscript received 5 Feb 85) pp 289-293

[Article by E.K. Gerlin (deceased): "Is Radioactive Decay Rate Constant?"]

[Abstract] A group of U.S. scientists, in trying to determine the age of lunar soil by lead/uranium and lead/thorium isotope ratios, arrived at values exceeding the accepted figure for the age of the earth. These scientists concluded that the lunar soil samples contain excess amounts of lead with 206, 207 and 208 atomic weights not associated with uranium,

actinouranium and thorium. In the present work it is shown graphically that the oldest lunar soil of age  $5.2-5.5 \times 10^9$  years does not contain excess lead not bound to  $U^{238}$ ,  $U^{235}$  and  $Th^{232}$  decay. Since all radiogenic lead isotopes contain these decay isotopes, it is hypothesized that the age figures obtained from  $Pb^{206}/U^{238}$ ,  $Pb^{207}/U^{235}$  and  $Pb^{208}/Th^{232}$  of  $(10 \times 10^9 - 14 \times 10^9)$  years, are related to a marked change in the radioactive decay rate of  $U^{238}$ ,  $U^{235}$  and  $Th^{232}$ . Evidently the radioactive decay rate of these elements during the early stages of the development of the solar system differed greatly from that of the present time. Figures 5; references 13: 3 Russian, 10 Western.

12765/9835  
CSO: 1841/596

UDC 541.15+546.799 (4)6

STUDY OF EFFECTS OF alpha-RADIATION ON VALENCE STATE OF ACTINOIDS. PART 9.  
BEHAVIOR OF CURIUM, AMERICIUM AND PLUTONIUM IN SODIUM PERCHLORATE SOLUTIONS

Leningrad RADIOKHIMIYA in Russian Vol 28, No 3, Mar 86  
(manuscript received 8 Feb 85) pp 335-337

[Article by A.A. Frolov, A.S. Kornilov and V.Ya. Vasilyev]

[Abstract] In a previous work it was observed that prolonged and intense alpha-radiation of saturated weak acid solutions of sodium perchlorate-ion containing americium III results in deposits containing americium and perchlorate-ion radiolysis products, the americium being partially in the penta-valent state. In the present work it is demonstrated that similar irradiation of concentrated weak acid solutions of sodium perchlorate containing curium III, americium III and plutonium IV results in both amorphous and crystalline deposits when there is a significant decrease in the acidity of the solution. The crystalline deposit is sodium chloride and the amorphous consists of actinoid hydroxides, in which plutonium exists in the hexavalent state and americium in both the tri- and penta-valent states. References 8 (Russian).

12765/9835  
CSO: 1841/596

EXTRACTION OF URANIUM (VI), TRANSURANIUM ELEMENTS AND EUROPIUM WITH BIDENTATE PHOSPHORUS AND PHOSPHORUS-NITROGEN-CONTAINING REAGENTS HAVING SUBSTITUENTS ON METHYLENE BRIDGE

Leningrad RADIOKHIMIYA in Russian Vol 28, No 3, Mar 86  
(manuscript received 26 Dec 84) pp 338-345

[Article by N.Ye. Kochetkova, O.E. Koyro, M.P. Nesterova, T.Ya. Medved, M.K. Chmutova, B.F. Myasoyedov and M.I. Kabachnik]

[Abstract] A study was made of the effects of substituents on the methylene bridge on the solubility, extracting capability and selectivity, in respect to the title elements, of 15 various phosphorus and phosphorus-nitrogen containing reagents synthesized at the Institute of Heteroorganic Compounds, USSR Academy of Sciences. Acid solutions of samples reagents were agitated, centrifuged and analyzed for alpha-, beta- and gamma-activity, and the distribution coefficients were determined. Results showed that substitution of hydrogen on the methylene bridge of tetraphenylmethylene diphosphine decreases its extracting capability in respect to the transplutonium elements, uranium VI and europium. A chlorine-substituted dioxide manifested a high selectivity towards americium. Figures 5; references 14 (Russian).

12765/9835  
CSO: 1841/596

UDC: 546.110.23:577.15/17

STUDY OF PROCESS OF INCLUSION OF TRITIUM INTO MOLECULES OF HALOGEN SUBSTITUTED BENZOIC ACIDS, FATTY ACIDS AND PROSTAGLANDINS

Leningrad RADIOKHIMIYA in Russian Vol 28, No 3, Mar 86  
(manuscript received 27 Jul 84) pp 376-380

[Article by V.P. Shevchenko, V.V. Bezuglov, T.Yu. Lazurkina, A.V. Potapova and N.F. Myasoyedov]

[Abstract] A study shows that labeled biologically active compounds can be prepared by selective dehalogenation or hydrogenation of an appropriate candidate compound. Tritium was included in halogen substituted benzoic acids, fatty acids, prostaglandins and their mixtures by treating them with gaseous tritium at 400 gPa pressure and in the presence of a palladium catalyst. The degree of dehalogenation and hydrogenation depends greatly on the nature of the biologically active compound. References 10: 8 Russian, 2 Western.

12765/9835  
CSO: 1841/596

## DIFFUSION OF RADIONUCLIDES IN ALKALINE ALUMOPHOSPHATE GLASSES

Leningrad RADIOKHIMIYA in Russian Vol 28, No 3, Mar 86  
(manuscript received 6 Dec 84) pp 398-402

[Article by I.A. Ivanov, V.M. Shatkov, A.N. Gulín and N.G. Florovskiy]

[Abstract] Classification has become an economically and technically acceptable variant for hardening highly active wastes, alkaline alumoborosilicate and alumophosphate glasses being the most useful. However, diffusion can be significant during radionuclide delocalization processes in these materials and the migration of isotopes, especially strontium and cesium, is of great interest. In the present work, a study of the effects of crystallization and irradiation on the migration of  $^{90}\text{Sr}$  and  $^{134}\text{Cs}$  are about 4 orders less at temperatures near the transformation temperatures of the glasses than that of  $^{22}\text{Na}$ . At comparable temperatures Sr and Cs radionuclides migrate 30-700 times faster in alumophosphate glasses than in alumoborosilicate glasses. Crystallization of alumophosphate glasses increases the diffusion mobility of  $^{90}\text{Sr}$  and  $^{134}\text{Cs}$  and lowers that of  $^{22}\text{Na}$ . Irradiation of both glasses with gamma-quanta has no noticeable effect on  $^{22}\text{Na}$  diffusion. Figure 1; references 17: 2 Russian, 15 Western.

12765/9835

CSO: 1841/596

UDC: 546.799.6:565.37

## RADIOLUMINESCENCE OF CURIUM (III) IN SOLUTIONS

Leningrad RADIOKHIMIYA in Russian Vol 28, No 3, Mar 86  
(manuscript received 1 Dec 83) pp 403-407

[Article by A.B. Yusov, V.P. Perminov, N.N. Krot and V.P. Kazakov]

[Abstract] The trivalent curium ion is the only transuranium element ion known to exhibit luminescence in the visible range. In the present work a study was made of the radioluminescence of curium (III) in the presence of alphasradiation in aqueous, heavy water and organic solutions. Maximum luminescence occurs at 600 nm wavelength, the radioluminescence yield  $G$  being proportional to the curium concentration. At  $10^{-2}$  mole/liter aqueous  $\text{Cm}(\text{NO}_3)_3$   $G$  is roughly equal to  $5 \times 10^{-4}$  quanta at 100 ev absorption energy. In dilute solutions the radioluminescent yield is the same as in neutral solutions, but in concentrated acids it changes significantly. The yield also increases in the presence of formate, acetate and citrate ligands due to complex-formation resulting in diminished extinction of excited curium by molecular water. A marked increase in the radioluminescent yield of curium was observed in heavy water and organic solvents. It was concluded that



radioluminescence of curium in solutions without ligand energy donors takes place chiefly directly, and energy transfer from solvent to curium is insignificant. Figures 3; references 8: 2 Russian, 6 Western.

12765/9835

CSO: 1841/596

UDC 628.336.3

#### IRRADIATION OF LIQUID MEDIA BY ACCELERATED ELECTRONS IN REPLACEMENT REACTOR

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 59, No 10, Oct 86  
(manuscript received 27 Dec 82) pp 2364-2368

[Article by A.Yu. Ivanov, A.L. Shevchenko and G.M. Ostrovskiy]

[Abstract] A study of irradiation of liquid media by accelerated electrons in 4 types of radiation-chemical reactors is described and discussed. A mathematical model was used to study radiation-chemical reactors with depth equal to the depth of the reaction zone (free path of accelerated electrons) or with depth exceeding the depth of the reaction zone. Study of this model showed that, after the same length of stay of the irradiated medium in radiation-chemical reactors, the concentration profile of the expended component depended upon the type of radiation-chemical reactor, the energy of the accelerated electrons, the form of the kinetic equation and the depth of the radiation-chemical reactors. A trough shape reactor with artificially roughened bottom was needed when irradiation of liquid media by accelerated electrons in a laminar regime requires maximum evenness of concentration deep in the reaction zone. When heterogeneity of concentrations of components is irrelevant, a trough-shape or channel-shape reactor may be used. An ideal replacement type reactor may be used with adequate accuracy for calculations of the process of irradiation with the reactor types studied, at a depth equal to the length of the free path of the accelerated electrons. When the reactor depth exceeds the length of the free path of the accelerated electrons, a diffusion model must be used. Figures 6; references 6 (Russian).

2791/9835

CSO: 1841/39

## EFFECT OF gamma-IRRADIATION ON IR-ABSORPTION OF KCl CRYSTALS

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 44, No 1, Jan 86  
(manuscript received 23 Jul 84) pp 156-159

[Article by L.V. Udovichenko, V.I. Goriletskiy, N.N. Kosinov,  
A.I. Mitichkin, A.N. Panova and T.A. Charkina]

[Abstract] gamma-Irradiation of KCl crystals results in an increase in the optical absorption coefficient at the CO<sub>2</sub>-laser generation frequency, thereby limiting the use of such crystals as passive elements. Infrared and UV-spectroscopy as well as laser calorimetry were used to study gamma-irradiated KCl crystals obtained by growing them in air and doped with OH<sup>-</sup> and O<sub>2</sub><sup>-</sup> ions (I), and in a fore-vacuum containing only OH<sup>-</sup> ions (II). Formation of sites that are stable and unstable at room temperature was observed in both sets of crystals after the gamma-irradiation. At equal OH<sup>-</sup> ion concentration, the quantity of both types of sites is greater in type I crystals than in type II crystals. The activation energy of the process of stable site disruption was determined. Figures 4; references 7: 5 Russian, 2 Western.

12765/9835  
CSO: 1841/438

UDC 621.375.8:541.427:661.65:546.271

## INCREASE IN REACTIVITY OF BORON, CARBON AND BORON CARBIDE EVAPORATED BY LASER RADIATION

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 20, No 6, Nov-Dec 86  
(manuscript received 25 Jan 85) pp 532-537

[Article by T.V. Kuznetsova, G.M. Kurbatov, A.N. Skachkov, G.F. Sosnina,  
G.I. Stolyarova and G.V. Shmerling]

[Abstract] Results are presented from studies of gas-phase reactions occurring upon laser evaporation of boron, carbon and boron carbide in an atmosphere of hydrogen in a cylindrical glass reactor with three NaCl windows for input of laser radiation and IR spectral analysis, with the walls of the reactors cooled with liquid nitrogen. A CO<sub>2</sub> laser produced 1 μs pulses with an energy of 1.6 J. The products of the intense sublimation, caused by the laser pulse, precipitated on the internal cooled surface of the reactor. The major product of laser irradiation of carbon was acetylene, representing up to 70% of the weight loss of the carbon target. The gaseous products of the reaction of boron carbide with hydrogen upon laser irradiation were diborane and methane. A possible mechanism of the synthesis of diborane and hydrocarbons is suggested. The role of the laser radiation is to heat and evaporate the condensed reagents, producing reactive atoms and molecules in

the gas phase. The high energy density of the laser radiation allows effective evaporation of carbon, boron and boron carbide at hydrogen pressures of up to 100 kPa. References 14: 6 Russian, 8 Western.

6508/9835

CSO: 1841/92

UDC 533.6.011

NEUTRAL CHEMICAL COMPOSITION OF PLASMA OF WAVEGUIDE CO<sub>2</sub> LASER WITH BERYLLIUM OXIDE CAPILLARY

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 20, No 6, Nov-Dec 86  
(manuscript received 9 Dec 85) pp 557-558

[Article by V.I. Volchenok, V.N. Ochkin, A.P. Simonov and N.N. Sobolev,  
Scientific Research Physical Chemistry Institute imeni L.Ya. Karpov]

[Abstract] This article studies the composition of neutral components in the direct current discharge of a CO<sub>2</sub> waveguide laser with a beryllium oxide capillary, inside diameter 1.5 mm, length of discharge portion 100 mm, using CO<sub>2</sub>-N<sub>2</sub>-He in a typical 1:1:8 ratio. The results of the measurement for a pressure of 1.3 kPa are presented as the concentration of CO<sub>2</sub>, O<sub>2</sub> and O in percent with respect to CO<sub>2</sub> concentration in the initial mixture as a function of current density. Upon transition from the glass tube to the BeO tube, the depth of decomposition of CO<sub>2</sub> decreases. The density of oxygen atoms also decreases significantly in the BeO capillary, which may deactivate the laser levels. The densities of O<sub>2</sub> and NO molecules are similar in the two tubes. The changes in plasma chemical composition are attributed to the increase in the recombination rate constant of oxygen atoms with carbon monoxide molecules on the surface of the ceramic in comparison to the glass. Figure 1; references 7: 4 Russian, 3 Western.

6508/9835

CSO: 1841/92

METHOD OF OVERLAPPING RELAXATIONS: PHOTOLYSIS OF  $i\text{-C}_3\text{F}_7\text{I}$

Moscow KINETIKA I KATALIZ in Russian Vol 27, No 5, Sep-Oct 86  
(manuscript received 10 Jun 85) pp 1055-1062

[Article by G.A. Skorobogatov, O.N. Slesarov and N.D. Torbin, Scientific Research Institute of Chemistry of the Leningrad State University imeni A.A. Zhdanov]

[Abstract] A laser version of the method of overlapping relaxations was utilized to study the photodissociation of alkyl and perfluoroalkyl iodides (RI). After irradiation with a short, powerful light pulse, the iodide RI, diluted in a great excess of inert gas, is struck once more by another short, powerful laser pulse and information is extracted from the variation in final quantum yield as a function of the time interval between the two laser pulses. This determines second-order reaction rate constants of recombination of the  $i\text{-C}_3\text{F}_7$  radicals with themselves and with iodine atoms. An explicit expression is derived for the quantum yield of the iodine atoms in the first stage of photodissociation of  $i\text{-C}_3\text{F}_7\text{I}$  molecules. Figures 3; references 17: 13 Russian, 4 Western.

6508/9835  
CSO: 1841/115

UDC 678.063:541.12.012:539.37

STRUCTURE AND INTERPHASE TRANSITION REGION OF RUBBER-GROUND VULCANISATE AND ITS EFFECT ON PROPERTIES OF COMPOSITES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 29, No 9, Sep 86 (manuscript received 10 Jun 85) pp 3-21

[Article by N.D. Zakharov, S.V. Usachev and D.P. Yemelyanov, Department of Chemistry and Technology of Elastomer Processing, Yaroslavl Polytechnic Institute; Yaroslavl Tire Plant]

[Abstract] A literature review is presented of papers appearing since 1964 on the structure of the transition region in elastomer mixtures, specifically those consisting of rubber and ground vulcanisate. Effects of various factors on the structure of this layer were analyzed along with their influence on the distribution of tensions in the medium surrounding the dispersive phase. The structure of this interphase layer may change during their deformation due to possible local crystallizations of various layers if one of their components happens to be a crystallizing elastomer. The fillers may play an important role in formation of the interphase layer, but there are no literature data on this topic as of now. Figures 9; references 68: 66 Russian (1 by Western author), 2 Western.

7813/9835

CSO: 1841/109



## WATER TREATMENT

UDC 628.16.08

### RADIATION TREATMENT OF EFFLUENTS IN PETROCHEMICAL INDUSTRY

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 10, Oct 86  
pp 38-41

[Article by S.A. Brusentseva, Institute of Electrochemistry imeni A.N. Frumkin, USSR Academy of Sciences]

[Abstract] A brief discussion of methods of radiation preparation of water used in industry and radiation purification of effluents show that many of these methods may be used in the petrochemical industry. The most promising methods include: final purification and decontamination of effluents after biological purification with subsequent use in industry, purification of effluents by radiation treatment combined with adsorption or flotation and radiation inactivation of sulfur bacteria in water used in petroleum production. References 29: 14 Russian, 15 Western.

2791/9835  
CSO: 1841/63

UDC 628.3

### COMPREHENSIVE WASTE WATER TREATMENT FOR VILLAGE AND ENGINE REPAIR PLANT

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 11, Nov 86  
pp 23-24

[Article by G.I. Gutina, candidate of technical sciences, Central Scientific Research Institute of EP [expansion unknown] of Engineering Construction]

[Abstract] Standard technology for water treatment was adapted to village settings with engine repair plants in the vicinity. The system designed for the Ulyaninsk Engine Repair Plant and the nearby village in the Moscow Oblast encompassed settlement tanks, neutralization, coagulation, filtration and flotation, as well as an oil trap resulting in removal of 90% of the suspended matter and 94% of the oil products. For neutralization the water

was treated with sulfuric acid, while coagulation was effected with aluminum sulfate. This development represents a new trend for rural engine repair plants, since previously the waste waters from such installations were discharged into the common sewer system without treatment. Figures 2.

12172/9835

CSO: 1841/93

## ACOUSTIC RELAXATION IN 1,4-BUTANEDIOL

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: SERIYA 2: KHIMIYA in Russian  
Vol 27, No 5, Sep-Oct 86 (manuscript received 17 May 85) pp 486-489

[Article by T. Zhumayev, B. Ovlyakulyyev and M.I. Shakhparonov, Department of Physical Chemistry]

[Abstract] The amplitudinal coefficient of absorption and the speed of sound in liquid 1,4-butanediol in a frequency range of 1MHz-6GHz and a temperature range of 293-333 K are measured and discussed. Relaxation parameters were determined. Significant dispersion of the speed of sound was seen in 1,4-butanediol in the frequency and temperature ranges studied with one simple region of acoustic relaxation in 1,4-butanediol acoustic spectra. Relaxation force of this region decreased with temperature increase. Reactions of rupture of one intermolecular O-H...O bond produced acoustic relaxation in this alcohol. Rate constants of reactions of formation and rupture of one intermolecular O-H...O bond in liquid 1,4-butanediol were determined. Figures 2; references 3: 1 Russian, 2 Western.

2791/9835  
CSO: 1841/60

## PHOTOCHEMICAL AUTOCLAVE

Moscow KHIMIYA I ZHIZN in Russian No 1, Jan 86 p 32

[Abstract] A reactor suitable for conducting photochemical reactions under high pressure was developed at the Institute of Organic Chemistry, USSR Academy of Sciences. The reactor consists of a stainless steel cylinder containing a teflon-coated agitator. It has a pressure gage, a charging hatch and a quartz port. The reaction mixture is irradiated with a light source such as a DRSh-500 lamp through an optical system consisting of a concave-convex lens, heat and optical filters, a diaphragm and a focusing

lens. The reactor is capable of handling up to 60 atm. pressure and temperatures from -50° to +180°C. (The title article was abstracted from an original, first printed in KHIMIYA VYSOKYKH ENERGIIY, Vol 19, No 4, p 349.) Drawing.

12765/9835  
CSO: 1841/432

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July 24, 1987